

# **How collaborative practices influence a global agricultural value chains' capability to co-innovate**

by

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## **Abstract**

*How do collaborative practices influence a global agri-chain's capability to co-innovate?*

This study used an interpretative qualitative multi-case study approach. Three frameworks were chosen as the underpinning theoretical frameworks due to their emerging relevance: 1) Hansen and Nohria's (2004) Four Barriers to Collaborative Advantage, to examine individual engagement; 2) Mohr and Nevin's (1990) Communication Strategies to investigate communication practices; and 3) MacCormack et al's (2007) Four Pillars of Collaborative Capabilities as a lens for chain architecture. These frameworks were also chosen explicitly for how they fit together for the purpose of addressing the research question.

Participants were purposively sampled from three global agri-chains. Data were collected by interviewing 29 employees about their co-innovation projects and practices using convergent interviewing. Audio recordings were transcribed in N-Vivo for categorisation, coding and unitisation. Excel matrices and tables were used to draw conclusions and theory development.

The collaborative chain participants showed greater willingness to collaborate and were better able to transfer tacit knowledge than the trading chain. The communication styles reported to be utilised in successful co-innovation projects were bi-directional, informal, indirect, transparent and face to face. None of the chains significantly organised their people, processes or platforms for collaboration however, the collaborative chains did take a programmed approach to co-innovation.

The most significant contribution of this thesis is the proposed integrated model on how to establish co-innovation facilitators in global agri-chains. It is suggested that the collaborative practices influence co-innovation through three broad co-innovation facilitators: 1) strengthening chain relationships; 2) improving information exchange; and 3) creating a co-innovative environment.

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## **List of Abbreviations**

AVCC	Australian Vice-Chancellor's Committee
BE	Behavioural Economics
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CM	Category Management
DC	Distribution Center
DHHS	Department of Human and Health Services (USA)
DIFOTQ	Delivery in full, on time and in quality
ECR	Efficient Consumer Response
EDLP	Everyday low price
EU	European Union
FOB	Free on Board
FMCG	Fast Moving Consumer Goods
GDP	Gross Domestic Product
GM	Genetic Modification
GVC	Global Value Chain
HDEC	Health and Disability Ethics Committee (New Zealand)
HR	Human Resources
HRC	Health Research Council (New Zealand)
HREC	Human Research Ethical Committee
KPI	Key Performance Indicator
MA	Modified Atmosphere
MNC	Multinational Corporation
MRC	Medical Research Council (Canada)
NPD	New Product Development
NSERC	Natural Sciences and Engineering Research Council (Canada)
OECD	Organization for Economic Cooperation and Development
OPRR	Office for Protection from Research Risks (USA)
PBR	Plant Breeders Rights
PLU	Price Look UP
PO	Purchase order

POS	Point Of Sale
R&D	Research and Development
RFID	Radio Frequency Identification
RST	Retail Standard Tray
SC	Supply Chain
SCM	Supply Chain Management
SKU	Stockkeeping Unit
SSHRC	Social Sciences and Humanities Research Council (Canada)
VC	Value Chain
VCA	Value Chain Analysis
WTO	World Trade Organization

## **Introduction**

### ***What is the problem?***

As the global population increases and agri-chains evolve, consumers are getting further away from the farm gate and increasingly reliant on global agri-chains to feed them (Marshall, 2004). The changes and challenges in the global landscape mean innovation is now considered one of the most important strategic issues for agri-food chains (Grunert et al., 1997; Meulenbergh & Jongen, 2005; Roucan-Kane et al., 2013) and the only source of long-term competitive advantage in the agri-food industry (Fearne & Hughes, 2000). We must think about how we are going to manage our agri-food chains in order to feed the world with the products they desire, when they desire them.

### ***What is the main research question?***

The goal of this study is to expand our understanding of co-innovation in global value chains which is investigated in an agricultural context. The main research question is:

*‘How do collaborative practices influence a global agri-chain’s capability to co-innovate?’*

### ***Why is this problem of interest?***

The context for this study is global agricultural value chains. This is an interesting area from a research, practical and personal point of view. From a research perspective, studies in co-innovation in value chains phenomena have tended to be conducted in high-tech industries (Van de Vrande et al., 2009) however, since agri-chains have their own distinguishing features in terms of their production constraints, innovation, culture and industry structure, it is important that special studies are conducted within the sector (Meulenbergh & Jongen, 2005). From a practical point of view, co-innovation strategies are relatively under-utilised in the agricultural sector (Fearne, 2009) yet the area is of great importance to the industry. On a more personal note, my background is in the fresh produce industry. I hope this work contributes meaningful insight and food for thought for other industry professionals.

## ***Thesis structure***

This thesis comprises five chapters. The structure is as follows:

### ***Chapter 1: Literature review summary***

The literature review chapter provides a background to the phenomena of interest (co-innovation in global value chains) and research context (agricultural industry). The review of the extant chain collaboration literature led this study to focus more closely on three themes; 1) how individuals in the chain engage with each other; 2) how they communicate with each other, and 3) the structures and processes (architecture) that integrate the chain. Whilst each of these themes emerged as relevant during the planning phase of the project the frameworks chosen to investigate each theme are not intended to fully answer the research question in isolation. These particular constructs were explicitly selected in order to fit together to address the main research problem. The three frameworks are: Hansen and Nohria's (2004) framework on how to build collaborative advantage by eliminating barriers of individuals' unwillingness and inability to collaborate, which is used to examine individual engagement. Mohr and Nevin's (1990) theoretical model on communication strategies in marketing channels which is used as the lens to communication practices, and MacCormack et al's (2007) proposed 'Four Pillars of Collaborative Capabilities' which is selected as the framework for chain architecture.

### ***Chapter 2: Research design and methods summary***

This study is based on an interpretative qualitative multi-case study approach with a research design based on Rosenberg and Yates' (2007) schematic for case study research. In the literature review the project themes of individual engagement, communication and chain architecture were identified, the three guiding frameworks selected and further subsidiary questions were developed. Participants were purposively sampled from three global agri-chain case chains. The selected chains were, 1) Chains which were currently exporting / importing an agricultural product across the Pacific Ocean; 2) Chains which had a long history of working with a global, in-market partner; and 3) Chains where both partners were willing to participate in the study. Preliminary interviews indicated the nature of each chain with respect to co-innovation. This allowed a structured approach to be made in the interviewing process. Chain one was a collaborative

chain and was used as a theory building case, which was compared to a similar case (chain two) and contrasted with a differing arms-length trading chain (chain three). Data were collected by interviewing 29 employees of chain organisations about the three themes and their co-innovation projects using convergent interviewing technique. Audio recordings uploaded and transcribed into N-Vivo where categorisation, coding and unitisation were performed. Excel matrices and tables were also used to draw conclusions and theory development.

### ***Chapter 3: Results***

The findings from the interviews are structured by reporting on each of the frameworks in turn. The key findings are as follows:

Engagement findings: The collaborative chain participants showed greater willingness to collaborate and were better able to transfer tacit and complex knowledge than in the trading chain. However, the collaborative and trading chain participants were equally able to seek and find expertise within their partner organisation.

Communication findings: The collaborative chains used highly frequent, bi-directional, (mostly) informal and indirect communication practices. The communication styles reported to be utilised in successful co-innovation projects were bi-directional, informal, indirect, transparent and face to face communication.

Architectural findings: None of the chains significantly organised their people, processes or platforms for collaboration and in these elements there were no discernible differences between the collaborative chains and the trading chain. However, the collaborative chains did take a programmed approach to co-innovation which was both aligned with the MacCormack et al. (2007) framework and where the collaborative chains differed from the trading one.

### ***Chapter 4: Discussion summary***

In the discussion chapter I discussed what might findings might mean for co-innovation in global agri-chains, comparing and contrasting my findings with the chosen constructs and

supporting literature. Whilst some differences were found between my findings and the original findings of the framework, all of the guiding models applied well to this context. The existing frameworks were extended by this work in several ways. They were applied to different contexts in terms of unit of analysis and industry and speculative models of how each of the constructs might influence co-innovation were suggested. The models were also extended in these additional ways: the Hansen and Nohria (2004) framework was extended in terms hierarchy as a moderator to collaborative ability. The Mohr and Nevin (1990) model was extended with additional communication elements which were found to be apparent in the co-innovation projects of this chain; and the MacCormack et al (2007) framework was extended in that the authors treated each of the pillars as stand-alone structures, I found that the apparent elements of the first three pillars (people, processes and platforms) were not structures of the individual businesses, but sub-structures of the chain's joint programme. These extensions are important contributions of this thesis.

The most significant contribution of this thesis, however, is in the integration of the chosen guiding frameworks in order to address the problem of how collaborative practices in global agri-chains influence the chain's co-innovation capabilities. The integrated model presented in chapter 4, figure 4, suggests the constructs together intersect and influence co-innovation through three broad co-innovation facilitators: 1) strengthening the chain relationships; 2) improving chain information exchange; and 3) creating a co-innovative environment. Furthermore, it is theorised, that in the suggested integrated framework (chapter 4, figure 4) the elements are looped together. The flow of this model can increase with collaborative structures, practices, and in the presence of trust, information exchange and a collaborative culture, or conversely, when trust is broken, the information exchange breaks down and the collaborative environment sours resulting in the co-innovation cycle slowing down.

Since all three constructs selected as the guiding frameworks for this agribusiness study, were from non-agricultural industries, I also discuss my findings in light of the challenges and nuances of the agricultural sector which include; the impact Mother Nature has on the sector making supply and demand unpredictable, volatile and complex (Stirling, 2013) by which I suggest leads to greater emphasis on the coordination process; the difficulties of collaborating in commodity markets (Fearne et al., 2001) by which I suggest leads to the



need to manage branded varieties; the long product development times for new varieties (Kilgour et al., 2008) by which I suggest leads to the adoption of a programmed approach; and the adversarial nature of the agricultural sector (O'Keeffe, 1998) by which I suggest leads to less use of technology to connect the chain, and a greater focus being on building strong relationships.

### ***Chapter 5: Conclusion summary***

The conclusion chapter provides a summary for this thesis. I offer practical and research implications which have emerged from this work. I address research parameters of interviewer bias, sampling bias, researcher bias and researcher error.

Suggestions for future research include testing divergences between this study's findings and the guiding frameworks; examining the role of intermediaries in co-innovation in chains and investigating seniority as a moderator on an individual chain member's ability to develop co-innovation outcomes in the chain.

Finally I show that this is an original contribution to the field of co-innovation in agri-chains by its application of existing frameworks to a new context, by the extensions of the existing frameworks and by, most importantly offering a speculative model on how these elements in combination might fit and loop together to influence co-innovation outcomes.

## **Chapter 1: Literature Review**

### ***1.1 Introduction***

The primary goal of this study is to expand our understanding of co-innovation in global value chains which is investigated in an agricultural context. This chapter reviews the chain co-innovation literature and presents theories about how the existing work in the area might sit within an agricultural context in order to extend current thinking on:

*‘How do collaborative practices influence a global agri-chain’s capability to co-innovate?’*

Chain co-innovation literature is heavily set in high-tech sectors (Van de Vrande et al., 2009) is relatively under-utilised (Fearne, 2009) and under-researched (Roucan-Kane et al., 2013) in the context of agri-food chains. Since agri-chains have their own distinguishing features in terms of their production constraints, innovation, culture and industry structure, it is important that special studies within the sector occur (Meulenbergh & Jongen, 2005). This chapter begins by providing a background to the phenomena of interest (co-innovation in value chains) in section 1.2, and the background to the research context and what that might mean for this study are discussed in sections 1.3, 1.4 and 1.5.

The review of the extant chain collaboration literature led this study to focus more closely on three themes: 1) how individuals in the chain engage with each other; 2) how they communicate with each other and 3) the structures and processes (architecture) that integrate the chain. In order to investigate each of these themes within a global agri-chain context, a framework was chosen to serve as a guide to explore that theme. In selection of the constructs consideration was also given to their fit, as ultimately they need to be integrated together in order to adequately answer the main research question. Each framework will be discussed with additional propositions drawn from supporting literature in sections 1.6 – 1.9. In section 1.10, I consider possible outcomes with the intent of integrating the three frameworks. This review is then summarised in section 1.11.

## **1.2 Phenomena of interest**

### **1.2.1 Co-innovation**

‘Co-innovation’ is the melding of ‘collaborative’ and ‘innovation’ and in this study is defined as occurring when two or more vertically aligned businesses agree to collaborate to create something new (or modified) through the sharing of ideas, knowledge, expertise and opportunities that is beyond the scope, scale or capabilities of the individual companies (Ketchen et al., 2007; Miles et al., 2006). Innovations in the agri-food sector include products, processes, marketing and organisational innovations (Caiazza et al., 2014). Co-innovation is a sophisticated strategy requiring appropriate partners, structures, mind set and skills (MacCormack et al., 2007; Santos et al., 2004). Collaboration is widespread amongst professional communities such as doctors, scientists and scholars (Miles et al., 2006) and is now embraced by many businesses in a wide range of industries, including Boeing, BP, GlaxoSmithKline, Dell, Proctor and Gamble, Wal-Mart, General Mills, Caterpillar and Ford just to name a few.

Co-innovation, sometimes referred to as ‘co-creation’, ‘co-production’, ‘co-development’ or ‘participatory innovation’ (Greer & Lei, 2012), and should not be confused with outsourcing, where work is contracted out to an external partner (Walters & Rainbird, 2007). It is a step beyond ‘opportunity seeking’ where external ideas are sought to accelerate internal innovation (Santos et al., 2004) and also differs from ‘open innovation’ where knowledge flows purposefully to and from the locus business in order to innovate internally and take the outcome back out externally (Chesbrough, 2012).

Co-innovation may occur anywhere along the chain, for example, upstream with suppliers, such as Dell leveraging their suppliers assets to shorten both their delivery and payment cycles (Walters & Rainbird, 2007), or Boeing’s development of its Dreamliner 787 where the supplier contracts weren’t ‘build to print’ agreements, but rather to design specific components with other partners (MacCormack et al., 2007). Co-innovation can also occur downstream with business customers, such as Caterpillar’s leveraging distributors to provide post sale services (Walters & Rainbird, 2007); or even further downstream with end users (user-centric innovation) (Greer & Lei, 2012) such as Nike creating online customer communities who provide input, ideas and feedback on Nike’s products (Ramaswamy, 2008).

Whilst the above examples are all vertically aligned partnerships (which is the focus of this study) it should be noted that co-innovation can occur horizontally with competitors (co-opetition) such as GM's collaboration with Ford Motor Co. to develop a six-speed automatic transmission for front-wheel drive cars (Bartholomew, 2005); or with complementary horizontally connected businesses forming alliances, such as Mips Computer Systems taking on IBM and HP by building a constellation of other smaller computer businesses allowing them access to greater production capacity, markets, know-how and cash (Gomes-Casseres, 1997). Private businesses can co-innovate with government or educational institutions such as the Dutch Government working with real estate developers, architects, construction companies and consultants for more sustainable construction (Bossink, 2002). Co-innovation also varies in its legal forms, from formal creations of joint ventures and research and development (R&D) partnerships to looser non-exclusive alliances and agreements (Powell et al., 1996; Stirling, 2013).

The key motivation of co-innovation is to gain mutually beneficial collaborative advantage (Miles et al., 2006; Mohr & Spekman, 1994), and whilst there are many possible benefits to co-innovation, those benefits may vary from chain to chain (Walters & Rainbird, 2007) (table 1).

**Table 1: Benefits identified as possible outcomes of co-innovation**

Possible benefits of co-innovation	Example source
Building a chain competitive advantage and barrier to entry	(Fearne, 1998)
Creating innovations of higher value	(Hansen & Nohria, 2004; Santos et al., 2004)
Getting products to market faster	(Fjeldstad et al., 2012; Powell et al., 1996)
Sharing the costs of innovation	(Fjeldstad et al., 2012; MacCormack et al., 2007; Santos et al., 2004)
Sharing the risks of innovation	(Fjeldstad et al., 2012; Mohr & Spekman, 1994)
Gaining complementary knowledge and expertise	(Dyer & Singh, 1998; Walters & Rainbird, 2007)
Gaining scale and scope	(Gomes-Casseres, 1997; Simatupang & Sridharan, 2008)
Gaining access to markets, relationships and assets which allow for innovation to occur	(MacCormack et al., 2007)
Allowing for better foresight and decision making	(Hansen & Nohria, 2004; Stirling, 2013)
Gaining greater influence over parts of the chain out of the organisations' control	(Stirling, 2013)

The strongest collaborators have been found to also be the strongest financial performers (Cao & Zhang, 2008; Owen et al., 2008) and well run co-innovating groups should be able to 'out innovate' those that go it alone (Powell et al., 1996).

Despite the numerous documented benefits of co-innovation, the strategy has a high failure rate (Benavides et al., 2012; Leijnse et al., 2008; Park & Ungson, 2001). A 2010 Grocery Manufacturers Association survey found that 80% of collaboration efforts failed to add value (Benavides et al., 2012). A 2007 survey found that retailers, when asked about achieving desired collaborative results with suppliers, reported a satisfaction level of 2.9/5 and suppliers reported even lower, 2.6 out of 5 (Leijnse et al., 2008).

Critics of co-innovation argue that collaboration is an unrealistic ideal (Cox, 1999) since the aim of a business is to maximise profits for its own stakeholders (Cox, 1999; Mehlman et al., 2010). This idea that co-innovation is unrealistic, isn't just from a practical point of view but also a cultural one. Many of today's business leadership teams were educated and trained in the 1980s when the trend was for businesses to be divided into functional areas (or 'silos') and the focus was on production, optimisation and operational efficiency (Fearne, 2009). Collaboration strategies are completely counter-intuitive to the business narrative and negotiating techniques of that time and that have been honed throughout their careers (Leijnse et al., 2008).

Other authors suggest that this go-it-alone paradigm runs deeper than just the business culture of the 1980s, but that Western society as a whole is too opportunistic and individualistic to be comfortable with collaborative practices (Cox, 1999; Miles et al., 2006). Cox and Thompson (1998) argue that since the collaborative chain approach is modelled on the success of the Japanese car industry and thus collaborative practices were developed in a collective culture, then thinking that they can be transferred broadly across industries in the West is unrealistic (Cox, 2001). Miles et al. (2006) agree that co-innovation is a strategy that is not as well-suited to highly competitive societies where the culture is to focus on one's own gains. These views may have been voiced before co-innovation had been widely adopted and perhaps co-innovation in the West is only just in the last few years come of age. An online search of the key word 'co-innovation' powered by EBSCOhost in September 2015 brought up 1,111 peer reviewed research articles. The same key word search of publication dates up to and including 2010 uncovered just 126 articles. In 2006 when Miles et al. (2006) argued that co-innovation may not be a strategy available to competitive cultures, there were a mere 48 articles. The adoption of new management practices takes time and the rate of adoption and diffusion can be affected by their relative advantage, compatibility, complexity, trialability and observability (Rogers, 2003). Co-innovation practices may have taken some time to be adopted by today's management teams whose business practices with a silo and 'me first' attitude have been well entrenched in the company culture. Co-innovation is a complex strategy (MacCormack et al., 2007) and the benefits of co-innovation may take some time before they are observable in a chain further slowing the adoption of the approach.

Collaborative partnerships can't occur without trust (Barczak et al., 2010; Ketchen et al., 2007; Kumar, 1996; Park & Ungson, 2001) but trust can wax and wane with conflicts and perceptions of equity (Park & Ungson, 2001). Lack of trust leads to a perceived increase in the risk of opportunistic behaviour, such as a partner reneging on agreements or not acting in good faith (relational risk) (Das & Teng, 2001; Park & Ungson, 2001); yet building a trusting relationship requires some loss of autonomy (Mohr & Spekman, 1994; O'Keefe, 1998) which can lead to concerns that the business will be restricted by being locked into an agreement when something better comes along (Zaheer et al., 2000). Thus commitment and dependence are widely acknowledged as central to chain collaboration (Geyskens et al., 1998).

The rewards of co-innovation often come well after the pain of risks and costs (Park & Ungson, 2001), which means collaborators have to stick with it long enough to reap the benefits. This can be challenging in itself when partnerships are subject to performance risks, such as the partner doesn't have the anticipated skills to collaborate as intended (Nambisan, 2002) or the partnership is simply unable to implement the joint projects (Barratt, 2004) or achieve their goals (Brockhoff, 2003; Das & Teng, 2001).

There may also be relational risks such as the risk of divergent goals resulting in conflict (Tidd et al., 2001) or that the partner suddenly pulls out of the collaboration and disrupts the work already achieved (Nambisan, 2002). Intellectual property risks should also be considered. As an example, confidential internal information and knowledge may be leaked and end up in unintended places (Brockhoff, 2003; Nobeoka et al., 2002; Tidd et al., 2001).

There may also be additional costs involved in co-innovation. Co-innovation adds complexity (Park & Ungson, 2001), and it is time consuming (Greer & Lei, 2012) particularly in regards to management time (Fearne, 2009). As shown in table one, some proponents suggest that one of the benefits of co-innovation is sharing the costs of innovation (Fjeldstad et al., 2012; MacCormack et al., 2007). However, this isn't always the case. A survey of over 100 alliances in the United Kingdom found that despite the intention to reduce innovation costs by collaborating with partners, around half of the survey respondents reported higher

development costs associated with collaboration than what they would have spent in internal new product development (NPD) (Tidd et al., 2001).

Despite these challenges and risks, the volume requirements of large retailers mean that buyers are becoming more interested in working together (Calvin et al., 2001), and 70% of retailers and suppliers expect to co-innovate with a partner in the future, even though many of them don't yet know how they will achieve that (Leijnse et al., 2008). From a resource-based view, where assets and capabilities provide competitive advantage, resources must be valuable, rare, inimitable and difficult to substitute (Barney, 1991). A co-innovative chain partnership can provide these valuable and inimitable resources (Zaheer et al., 2000) therefore, despite the strategy not being easy to implement, co-innovation may provide competitive advantage for the chain.

### **1.2.2 Value chains**

The term 'value chain' dates back to the 1980s and was pioneered by Porter (1985) in his influential work 'Competitive Advantage' to describe the full range of activities from conception of a product (or service) to its end use. Porter (1985) identified nine business activities which work together to provide consumer value. At this time, the value chain referred to integrating systems internally within a business as it was assumed that competitive advantage was an internal pursuit (Ketchen et al., 2007; Sherer, 2005). Today, a value chain, connecting separate businesses from production to consumer, is different from 'vertical integration' where all the activities of the chain occur within the one organization (Stevenson & Pirog, 2008).

Another important idea of the 1980s, was Supply Chain Management (SCM), a term which was coined by British consultant, Keith Oliver, as an approach to tearing down functional silos and viewing company activities in one big picture (Laseter & Oliver, 2003). Through the 1990s technology enabled faster and greater data sharing and communication among suppliers and customers, and thus a more integrated supply chain view emerged as the next step in SCM (Sherer, 2005).



The terms 'supply chain' and 'value chain' are also sometimes called, 'extended enterprise' and 'integrated value systems' (Papazoglou et al., 2000) and describe viewing the organisation as part of interacting business processes where goods or services flow in one direction and demand and cash in the other (Walters & Lancaster, 1999). The primary focus of traditional supply chains, however, was production, and 1980s SCM was all about improving efficiency, reducing costs and pursuing operational excellence (Feller et al., 2006; Sherer, 2005; Walters & Rainbird, 2004). In value chain management, however, the central focus is on consumer value and the notion that consumers pull the chain towards the fulfilment of their requirements (Feller et al., 2006). In this view, the chain integrates common good solutions to an aligned objective of serving the consumer (Simatupang & Sridharan, 2008).

Supply chain practitioners and researchers have shifted in thinking from this 1980s SCM view however, and by the late 1990s and early 2000s the importance of identifying and adding value in the eyes of the consumer was also being acknowledged by SCM scholars and businesses (Laseter & Oliver, 2003). Today, there is almost universal acknowledgment that even the most efficiently run supply chains will lose out to chains who prioritise consumer value creation (Sherer, 2005; Walters & Rainbird, 2004). Many large companies today are spending billions of dollars on consumer insight technology and capabilities embracing behavioural economics (BE) in the hope of capturing benefits by understanding how their consumers behave (Cummings et al., 2015).

Realigning products and activities to consumer value requires a more relational view of the chain. The value chain (VC) approach views the chain as a whole system not businesses working in isolation (Feller et al., 2006; Simatupang & Sridharan, 2008; Walters & Rainbird, 2007). In the VC approach there is a shared vision and strategy (Bossink, 2002; Stirling, 2013). The VC partnership requires trust (Ramsay, 2005; Sherer, 2005), commitment, clear governance and strong leadership (Bossink, 2002; Stirling, 2013; Taylor, 2005), transparent bidirectional (or networked) information flows (Sherer, 2005; Walters & Rainbird, 2007), a commitment to fairness and the welfare of all chain participants (Stevenson & Pirog, 2008), coordination (Walters & Lancaster, 1999), and compatible processes and structures (Ramsay, 2005; Simatupang & Sridharan, 2008).

Since its inception, the key motivation of taking a value chain approach was to create competitive advantage (Porter, 1985), and in an increasingly tough and intense global environment that remains its purpose today (Feller et al., 2006). Value Chain Analysis (VCA) is a tool that can be used to translate consumer insight into a competitive advantage for the chain (Zokaei & Simons, 2006). First developed by Hines and Rich (1997), who developed mapping tools to understand a business' structure by breaking it down into individual processes in order to identify waste, necessary and value-adding activities in the system. If an activity isn't adding value for the consumer, then it is either a necessary activity, which should be completed as efficiently as possible, or one that is a waste of resources and those resources should be reallocated elsewhere (Womack & Jones, 2003).

Since the early 2000s, the 'Global Value Chain' (GVC) has emerged as a way of analysing the international expansion of supply chains (Gereffi & Lee, 2012). Its emergence reflected the trend towards the activities of contemporary chains taking place in different countries (OECD, 2013). The GVC concept is recognised by many of the world's most important international organisations including the World Bank, the World Trade Organization (WTO) and the Organization for Economic Cooperation and Development (OECD) (Gereffi & Lee, 2012; OECD, 2013).

### ***1.3 The research context***

#### ***1.3.1 Why agricultural chains are of interest***

There are now 7.3 billion people living on earth, and that number is expected to surpass 9 billion by 2050 (United Nations Secretariat, 2015). Not only are there increasingly more mouths to feed, but each person, on average, is consuming more. Since the 1960s, our per capita calorie intake has increased by over 500 calories each day (Pretty et al., 2010). It is estimated that the global demand for food will continue to rise to the extent that in 40 years-time we'll need to be producing 70 – 100% more food than we do today (Godfray et al., 2010; Pretty et al., 2010; Stirling, 2013). Food is one of our most basic needs, yet we tend to take our food supply for granted (Christopher, 2004).

In 2008, the cost of global food imports exceeded one trillion US dollars, having grown substantially from only a few years prior (Popp, 2009). There are several driving forces that are pushing the international food trade to an increasingly bigger scale (Meulenberg & Jongen, 2005). These drivers include such things as Gross Domestic Product (GDP) growth leading to urbanisation and a larger middle class with more money to spend on food (Stirling, 2013). With an increasing concern for health and nutrition this growing middle class is demanding more fresh produce, dairy and meat (Burch & Lawrence, 2005; Fearne & Hughes, 2000; Walters & Rainbird, 2004). In the US alone, 49 pounds (just over 22 kilos) more of fresh fruit and vegetables were consumed per capita in 1999 than in 1986 (Calvin et al., 2001).

We are also eating a greater ethnic diversity of food. Edwards (2012) argues that the popularity of sushi in America (albeit, an 'American-style' version) is a demonstration of the 'Asianisation' of Western food. Likewise, with increasing global interconnectedness and the spread of supermarket chains and fast food restaurants Western food has also grown in popularity in Asia (Pingali, 2007). This diet diversification leads to consumers demanding a greater variety of food (Calvin et al., 2001) and has resulted in global retailers searching for differentiated offers (Stirling, 2013). International suppliers are responding to this demand for diversity by going global in order to realise economies of scale and scope to meet the retailers' needs (Meulenberg & Jongen, 2005). In terms of logistics and trade we have increased know-how and efficiency in international shipping and in prolonging shelf life (Calvin et al., 2001) and the WTO is also contributing to this growth with trade policies designed to promote freer international trade (Meulenberg & Jongen, 2005).

As the population increases and agri-chains evolve, consumers are moving away from the farm gate and are increasingly reliant on global agri-chains to feed them (Marshall, 2004). This challenge is further intensified by increasing volatility, consumer scrutiny and the complexity of the agricultural sector (Stirling, 2013). The changes and challenges in the global landscape mean innovation is now considered one of the most important strategic issues for agri-food chains (Grunert et al., 1997; Meulenberg & Jongen, 2005; Rama, 1996; Roucan-Kane et al., 2013), and the only source of long-term competitive advantage in the agri-food industry (Fearne & Hughes, 2000). Maximising productivity is not enough (Pretty

et al., 2010), we must think about how to manage our agri-food chains in order to feed the world.

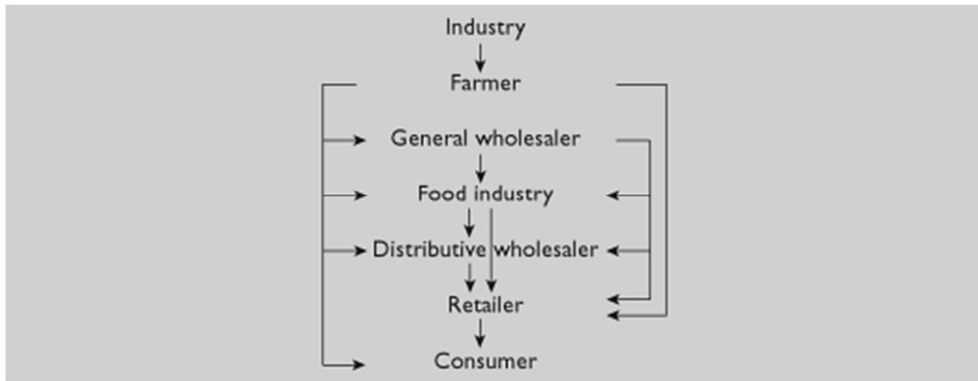
### ***1.3.2 The evolving structure and characteristics of agricultural chains***

Agricultural chains are complex and varied (Stirling, 2013) with numerous combinations of linking chain activities (Fearne et al., 2001). This makes describing 'typical' chains challenging. In today's reality, many agri-chains are neither totally transactional nor completely collaborative, but sit on a continuum between those two extremes (Fearne et al., 2001).

Despite the numerous variations, there are key global trends and pressures which have moved the disconnected agricultural supply chains of the 1980s towards a more co-ordinated and integrated approach today (Fearne et al., 2001). An understanding of chain dynamics in the industry is important for the context of this study and will be described in the following section, starting downstream at the retail end where increasing retailer dominance has been a driving force for many of these changes and how that has affected the mid and upstream sections of the chain.

In developed countries, product marketed directly from farm to consumer is the exception rather than the norm (Meulenbergh & Jongen, 2005). More typically, the product will be passed from the farmer through various intermediaries who pack, process, export and organise the movement of product through to the final consumer (figure 1) (Meulenbergh & Jongen, 2005).

**Figure 1: Basic patterns of agri-food marketing channels reproduced from Meulenber and Jongen (2005).**



**Source: (Meulenber & Jongen, 2005)**

### **1.3.3 The rise of supermarket dominance**

In the 1950s and 1960s, food manufacturers were the controlling force in most commodity sectors (Burch & Lawrence, 2005). However, since the 1970s the power has shifted to where most supply chains are now dominated by a highly competitive retail sector (Burch & Goss, 1999; Fearne et al., 2001; Marshall, 2004). The two main reasons for this shift are the emergence of a highly concentrated group of globally focussed retailers who hold enormous purchasing power over a relatively large number of processors, manufacturers and wholesalers (Burch & Lawrence, 2005; Calvin et al., 2001; Gereffi & Lee, 2012; Leijnse et al., 2008); and retailers capitalizing on their powerful position and developing and promoting their own in house (private label) products which compete with manufacturer branded products for shelf space and consumer dollars (Burch & Lawrence, 2005; Leijnse et al., 2008). In industrialized countries, 75% - 90% of food store sales pass through a small number of supermarket chain checkouts (Elitzak, 2015; Pretty et al., 2010; Stirling, 2013). In 2013 in the US, the top 20 grocery retailers accounted for almost 64% share of food store sales, with further concentration likely in the future (Elitzak, 2015). Australia and New Zealand are both dominated by just two major supermarket chains making the grocery trade in both countries one of the most concentrated in the world (Wilson, 2013). Supermarket chains are in the position where they can dictate which suppliers, and under what conditions can get shelf space in their stores (Burch & Lawrence, 2005).

#### ***1.3.4 A place for specialised intermediaries***

A number of businesses can sit between the retailers and the farmers, including wholesalers (traders), exporters and importers, distributors, brokers, re-packers and processors who are intermediaries between growers and retailers, food service buyers (who supply restaurants, hospitals, schools and hotels) and mass merchandisers (such as Wal-Mart, Costco and Sam's Club) (Calvin et al., 2001).

Some argue that wholesalers and agents, seen as costs to the chain, should be removed (Fearne, 2009) because intermediary businesses connecting the up and down stream ends are becoming irrelevant (Welch & Mitchell, 2000). Indeed, supermarket buying teams are seeking to cut costs that the wholesalers represent (Reardon et al., 2003). World-wide retailers are strengthening relationships with key suppliers who can provide year-round, safety-assured supply, and a larger share of vertically integrated growers/shippers are directly supplying large retailers (Calvin et al., 2001; Reardon et al., 2003). Supermarkets have also moved away from individual store procurement to distribution centres (DCs) that service a regional group of stores (Reardon et al., 2003). This centralisation, supported by specialised logistics systems (Reardon et al., 2003) and technology has also enabled shorter agri-chains (Meulenbergh & Jongen, 2005).

Despite this trend, shorter chains aren't necessarily more collaborative or innovative simply due to the direct retailer-supplier link. As an example, the dominant two Australian supermarket chains, Woolworths and Coles, have been increasingly going direct to suppliers and supplier-processes (Knox, 2014). Both retailers have been adopting the US and UK supermarket strategy for profit growth: demanding cost cutting and rebates from suppliers in order to bring prices down (Knox, 2014). The strategy to go direct has not been motivated by collaboration or innovation, but by cost cutting. The result is that direct suppliers have either enlarged and/or consolidated to meet the retailers' needs and demands, or they have gone out of business. Among the losses in this environment has been the variety of freshly grown food and specialty products (Knox, 2014). Both Woolworths and Coles have suffered from a lack of differentiated innovation and have struggled to separate themselves from each other in the eyes of consumers when 84% of customers aren't loyal to either Coles or Woolworths (Knox, 2014).

A different school of thought, which I support, argues that despite these direct relationships, intermediaries will remain important parts of the fresh produce chain (Meulenbergh & Jongen, 2005). In some cases, the intermediaries have even strengthened their position by responding to market needs such as wholesale companies that have built global networks, logistics capabilities and market knowledge. Some wholesale companies have differentiated themselves by carrying their own brands and others have built competencies in strategic forward and backward linkages (Meulenbergh & Jongen, 2005). These businesses will not be abolished, instead, they will bid for specialised supermarket contracts to fulfil a specific need (Reardon et al., 2003). This is particularly likely to be the case in global export-import chains where special knowledge and expertise is required (Meulenbergh & Jongen, 2005; Reardon et al., 2003). As an example Hortifruti acts as the buying arm for a major Central American retailer and likewise Freshmark take on a similar role for a supermarket in Africa (Reardon et al., 2003). Specialised intermediaries are likely to remain an important part of the sector's future, managing the supply, demand, economic and political changes (Stirling, 2013).

### ***1.3.5 An increasingly interwoven upstream: input industries and farmers***

Upstream in agricultural chains are the input industries and farmers. Input industries include genetics, fertilizers and feeds (nutrition), crop and animal health, machinery and equipment, and financial services such as credit and insurance (Stirling, 2013). The receivers of these inputs are the farmers, or growers, as they are often referred to in horticulture. When SCM came into focus in the 1980s, open or 'spot' market trading was the norm (Fearne, 1998; O'Donoghue et al., 2011). Farms were relatively small (O'Donoghue et al., 2011; Productivity Commission, 2005) and acted independently in negotiating their inputs, making their own decisions about what to plant, how much to produce and where to ship it. This led to a production-focussed supply chain where farmers would grow as much as they could resource and pushed their product down the chain through various businesses to the consumer (Burch & Lawrence, 2005). The chain was characterised by many shippers selling to many buyers in wholesale markets and short term supply and demand dynamics dictated price (Calvin et al., 2001).

In the 1990s this upstream end of the chain became increasingly interwoven as mergers, acquisitions and alliances took place to increase efficiency (Howard, 2009; Meulenbergh & Jongen, 2005) and to meet the needs of consolidating retailers (Calvin et al., 2001). A supermarket carries on average 40,000 stock-keeping-units (SKUs) (Food Marketing Institute, 2014) the effort and expertise required to manage the merchandising, profitability and supply of all of those products is enormous. The result of having such an enormous task in such a highly competitive environment, where retailers are desperate to cut costs and achieve performance improvements, (Matopoulos et al., 2007) combined with the complexity of international chains, and global pressures, was that chains had to find new ways of coordinating themselves beyond being controlled by the retailer themselves (Fjeldstad et al., 2012). In response, retailers have been developing exclusive relationships with fewer, favoured partners (Hingley, 2005) reducing the supply base down to those suppliers big enough and sufficiently competent to take on chain responsibilities (Ferne & Hughes, 2000).

The 1990s and early 2000s also saw the standardisation of global Price Look Up (PLU) codes (GS1 Australia, 2006) and the adoption and significant software updating of Point of Sale (POS) technology (Dion, 2003) both of which are a big part of collecting accurate sales data at check out and using that in sales analytics and inventory replenishment (Dion, 2003). Electronic Data Interchange (EDI) is another key technology of the 1990s allowing data to be electronically exchanged thereby significantly changing how partners can conduct business assisted by more timely, accurate and greater volumes of information exchange than when using manual systems (Kaufman et al., 2000; Mukhopadhyay et al., 1995). Radio Frequency Identification (RFID) was adopted into a retail context in the 2000s, further enriching information exchange to coordinate production and distribution between retailers and suppliers with the use of tags, readers and antennas (Asif & Mandviwalla, 2005). From a combination of the environment and supported by these new tools, retailers implemented category management (CM) programmes, where a preferred supplier takes greater responsibility for the entire product category from supply, to sales, to profitability and promotions (Hingley, 2005). The nature of the CM programme varies from one retailer to another (Duffy et al., 2003) however CM generally favours larger suppliers who have the size, resources and knowledge to manage the link between the supply base and the retailer



(Duffy et al., 2003). In the 1990s Efficient Consumer Response (ECR) was also launched which is a set of industry initiated, retailer / supplier collaborative practices in an attempt to streamline demand management to stimulate consumer demand; supply management to optimise supply and logistics; information technology and improvement tools to optimise the collaborative relationship (Corsten & Kumar, 2005). This type of collaboration between dominant suppliers and retailers includes the identification of consumption trends and consumer patterns and the sharing of this knowledge upstream (Matopoulos et al., 2007).

The reduction of the number of suppliers to a select group of preferred suppliers (Hingley, 2005) forced small family growers, too small to compete alone, to either join marketing cooperatives or build relationships to be linked to supply chains that had access to these competitive channels (Meulenbergh & Jongen, 2005). An increasing share of fresh produce today is produced under contracts which govern the quantities, formats and channels in which products are sold (O'Donoghue et al., 2011) where vertically integrated grower/shippers market their own and affiliated growers product (Calvin et al., 2001) (figure 2). A real life example of this is the New Zealand export Kiwifruit value chain where the growers, pack houses and exporters all sit under New Zealand Kiwifruit Growers Incorporated and send to overseas intermediaries and retailers (Kilgour et al., 2008).

Part of this upstream change has also come from the move from growing mass produced varieties to planting proprietary protected varieties, with 95% of new varieties marketed through closed horticultural chains (Trienekens et al., 2008). The decision to grow a new variety goes hand in hand with the decision to join the system that manages that product (Trienekens et al., 2008).

#### ***1.4 The current state of co-innovation in agri-chains***

Whilst many fresh produce suppliers recognise the increasing importance of innovation (Fearne & Hughes, 2000), innovation in the food sector is low (Alfranca et al., 2004; Bigliardi & Galati, 2013). Co-innovation partnerships are dominated by high tech industries in developed nations which made up 80% of the co-innovating partnerships in the 80s and 90s, whilst low tech industries, of which agriculture is a part, remained well under 10% (Hagedoorn, 2002). For those businesses in the agricultural sector that are innovating,

innovating with partners is not a popular strategy (Kapetanovic, 2010). A recent survey of more than 100 US Agribusinesses found that 62% of agribusiness managers preferred in-house innovation (Roucan-Kane et al., 2013). Presently, the key areas of agribusiness R&D spending are in plant genomics, biotech and animal breeding and health (Stirling, 2013).

Correspondingly, there is also a gap in agribusiness co-innovation research. Most collaborative innovation studies have been conducted in large, multinational, high tech companies (Van de Vrande et al., 2009). Agribusiness executives as a group are not often surveyed (Roucan-Kane et al., 2013) and the number of books and research papers focusing on innovation in agri-food systems are still limited (Meulenberg & Jongen, 2005).

#### ***1.4.1 Difficulties of agri-chains adopting co-innovation***

Whilst there has been a theoretical shift from product driven supply chains to value chains the reality is collaborative strategies are still underutilised in agribusiness (Leijnse et al., 2008). In a 1999 survey of fresh produce buyers and suppliers daily sales negotiations were still the most common arrangement across all products surveyed with the exception of bagged salads (Calvin et al., 2001). There are several nuances of the agricultural sector which make adopting co-innovation challenging. These include; the impact Mother Nature has on the sector making supply and demand unpredictable, volatile and complex (Stirling, 2013); the difficulties of collaborating in commodity markets (Fearne et al., 2001); the long product development times for new varieties (Kilgour et al., 2008); and the adversarial nature of the agricultural sector (O'Keeffe, 1998). These sector factors make co-innovation a challenge and will be discussed in further detail in this section.

#### ***1.4.2 Mother nature's impacts on agri-chains: unpredictability, volatility, perishability and complexity***

Agricultural production is highly dependent on the weather and climate (Cantelaube & Terres, 2005; MacDonald & Hall, 1980). Large climatic events, seasonal weather patterns and smaller incremental changes in soil nutrition, crop diseases, pests and weeds, and irrigation may all impact crops within a season and from year to year (Everingham et al., 2002; MacDonald & Hall, 1980) which translates to uncertainties in quantity, quality, consistency and timing of production (Stirling, 2013). This variability upstream and

consequent upstream decisions impact many other aspects of the chain (Everingham et al., 2002) including resourcing labour at harvest, transportation to market, promotional activity and sales commitments, ultimately creating an environment where agricultural products are highly volatile in price (Calvin et al., 2001; O'Keeffe, 1998).

Such volatile dynamics make negotiating buyer/supplier collaborative contracts difficult, where suppliers risk locking themselves into deals where they miss better prices on the open market, and buyers risk locking themselves into deals where they are overpaying for current market conditions, getting an inferior quality product (e.g. having an undesirable size) or not being provided with sufficient supply (Calvin et al., 2001). In fact, a UK retailer/supplier survey found that the contracts between retailers and their suppliers were informal, with no legally binding agreement for the retailer to take specific volumes (Duffy et al., 2003). The contracts generally consisted of product quality specifications, terms of trade and forecast volume programmes that were subject to change (Duffy et al., 2003).

Agricultural businesses are also dealing with highly perishable products, and the perishability of the product is an additional challenge for logistics, storage, packaging and handling (Gloy, 2005) and ultimately a cost for the chain. Complexity is further driven by consumer scrutiny of food safety, genetic modification (GM) and sustainable production (Stirling, 2013) which leads to retailers dictating tight quality and production standards (Gereffi & Lee, 2012) as well as leading to increasing government regulations on labelling and traceability, certification, pesticide use, GM food management and environmental issues (Marshall, 2004). Other political drivers such as governments subsidising specific crops or influencing trade with tariffs and other barriers also bring complexity and instability to the industry (Stirling, 2013). These uncertain conditions limit the degree of collaboration to tactical and operational activities in order to avoid committing to long term plans (Matopoulos et al., 2007).

#### ***1.4.3 Many agricultural products are commodities***

The degree in which collaborative partnerships can be developed is also influenced by the nature of the market (Fearne et al., 2001; Hughes, 1996; Spekman et al., 1998). Agriculture is characterised as a highly commoditised, low value added market with extreme open

market trading (Fearne, 1998) which is not suited to collaborative relationships (Fearne et al., 2001). In commodity markets, price, volume growth, market share and efficiency are key chain drivers (Fearne, 2009) which results in the relationship between chain members focusing on the division of value rather than the creation of value (O'Keeffe, 1998). For many agricultural products, long term agreements and joint management systems may be the extent of the collaboration (Fearne et al., 2001).

#### ***1.4.4 Product development of new varieties is a long term game and under consumer scrutiny***

In an agricultural context, product innovation is a limited, long term and costly commitment and for many small or medium sized agricultural businesses the planning horizon is too short (Fearne, 2009). Instead, many agricultural businesses remain focussed on lower risk and short term problem solving (Kilgour et al., 2008). Semi prepared or fresh cut offers (such as bagged salads and pre-cut or semi-prepared produce) and cultivars the obvious and visible innovations. However, fresh cut offers suffer from high capital costs, slotting fees and more stringent food safety requirements and an even shorter shelf life than unprocessed fresh produce (Buzby et al., 2009; Calvin et al., 2001), and a new fruit variety takes 10 or 15 years to get to market (Kilgour et al., 2008; Matopoulos et al., 2007) and the successful introduction of a new product requires a relationship with a network that can get that product to consumers (Capitanio et al., 2010). The development of a branded product is seen by companies of proprietary product, however, as critical to effective and profitable agri-chains (Kilgour et al., 2008).

A further consideration with product development in agribusiness is that it is rare for proprietary protected branded fresh products to be offered exclusively to any one retailer (Leijnse et al., 2008). The high volumes that need to be sold to recoup the costs of development and commercialisation mean that proprietary product owners are usually reluctant to risk selling it through just one channel. This means retailers find it difficult to get exclusivity on anything that can give them meaningful differentiation and struggle to offer a truly unique consumer value (Leijnse et al., 2008).

Consumer scrutiny on product safety in innovation also needs to be part of the discussion in agricultural NPD. Biotechnology covers both a mash-up of native traits or GM, where new genes are added or marker-genes selected that wouldn't occur naturally (Stirling, 2013). In some countries and regions, most notably in the European Union (EU), public opposition to GM crops is strong (Qaim, 2009), yet GM crops have risen rapidly in other parts of the world, notably the USA, Brazil and Argentina (Qaim, 2009; Stirling, 2013). Some consumers are also sceptical about the safety of packaging technologies and processing techniques (Bombaywalaa & Rianditab, 2015). Understanding consumer preferences is a challenge in itself (Fearne, 2009) but predicting consumer views on growing, shipping, storing and packaging techniques in a decade's time when today's developments are commercialised, is important to understanding where an agricultural chain should focus innovation efforts.

Process innovations are usually about productivity gains (Becker & Egger, 2008). Process innovation in agri-food can be about adopting new technologies which allow chains to produce higher quality products (Capitanio et al., 2010), and improved production and post-harvest systems (Kilgour et al., 2008) and new ways of presenting traditional products (Capitanio et al., 2010). Whilst these process innovations are important to chain success, product innovation has a stronger correlation with exporting than process innovation (Giovannetti & Marvasi, 2015) and longer term, high risk innovations are going to be how chains gain and maintain competitive advantage (Kilgour et al., 2008)

#### ***1.4.5 The adversarial nature of agri-business***

The agricultural sector is notoriously adversarial (Ada et al., 2011; Fearne, 2009; O'Keeffe, 1998) which is a challenge for chain collaboration (Ada et al., 2011). The fight for share of value in a commodity market and the volatile nature of supply and pricing in agriculture are conditions which put pressure on the partnership and lead to adversarial relationships (O'Keeffe, 1998). The low trust environment makes collaborative strategies more difficult and the process longer (O'Keeffe, 1998) and one of the reasons collaboration becomes much harder to implement than theory would suggest (Barratt, 2004). Significant cultural change is needed in the agricultural sector for co-innovation to occur (Ada et al., 2011).

#### ***1.4.6 Lack of meaningful integration with retailers***

The consolidation of the supermarket sector means retailers usually hold considerable power over suppliers (Hingley, 2005; Leijnse et al., 2008; Rossetti & Choi, 2005) and are one of the most adversarial links in the chain (Stevenson & Pirog, 2008). Combine this with the highly competitive environment between the large retailers (Kaufman, 2007; Marshall, 2004) and the result is retailers putting suppliers under relentless pressure to reduce prices for consumers.

A buyer/supplier collaboration survey suggested that buyers and suppliers had a different view on collaboration objectives (Spekman et al., 1998). Buyers are more interested in lowering costs and securing supply (Corsten & Kumar, 2005) whilst sellers are more focussed on enhanced profits, market position and customer satisfaction (Spekman et al., 1998). Buyers are more likely to have a traditional commodity paradigm where suppliers are replaceable and price is paramount (Spekman et al., 1998). Buyers are more sceptical about interdependence than suppliers (Spekman et al., 1998) which is one of the reasons (along with giving buyers exposure to different categories) retail executives often rotate the team members at the buying desk to avoid buyers building close ties with suppliers (Ada et al., 2011; Fearne & Hughes, 2000; Kumar, 1996). This practice is particularly problematic with seasonal products since there is a great deal of production knowledge required for accurate forecasting, ordering and merchandising and so new buyer relationships are often about training the buyer in product specifics (Duffy et al., 2003). Frequent buyer rotation also disrupts long term planning and projects (Duffy et al., 2003).

This all helps explain why buyers are still giving little formal input into suppliers' strategic decisions, planning processes or sharing consumer information (Fearne & Hughes, 2000). Some scholars argue there are obvious reasons why buyers are reluctant to participate in collaborative practices (Cox, 1999; Spekman et al., 1998). If retailers can get what they want through leveraging their purchasing power, then they have no incentive to collaborate (Cox, 1999). In reality, it is quicker and easier for busy buyers with short term efficiency and cost saving goals to use their power to squeeze suppliers than to put the time and effort into collaborative strategies (Rossetti & Choi, 2005). Buyers and suppliers are coming from such different world views and motivations within the supply chain that whilst the rhetoric for

collaboration might be there, in practice they fall back into traditional SC behavioural patterns (Corsten & Kumar, 2005; Spekman et al., 1998). “We are not there to grow *the* pie; we are there to grow *our* piece of the pie” said an Executive at Delhaize (Leijnse et al., 2008, p. 4). Ultimately the power imbalance impedes the ability for retailers to be involved in meaningful, long lasting relationships (Cox, 2001; Hingley, 2005).

Through CM and ECR, retailers are taking steps towards cooperation and a willingness to share information with key suppliers (Fearne et al., 2001). However, these systems in fresh produce still lag behind their fast moving consumer goods (FMCG) counterparts (Fearne et al., 2001) and fresh suppliers are still struggling to establish and maintain collaborative initiatives with retailers (Corsten & Kumar, 2005; Spekman & Carraway, 2006). Furthermore, the key suppliers who are given the ‘category captain’ positions in CM programmes are often large pre-packers or processors, resulting in retailers having very little to do with the growers and farmers (Duffy et al., 2003)

A key element in the value chain approach is the idea that insight into what consumers value is passed down through the chain so that the chain can be aligned to add value to wherever consumers preferences make so doing profitable (Fearne, 2009). However, in practice the consumer story isn’t always well understood by the retailers (Ada et al., 2011) when consumer research is conducted it is increasingly done by specialised consumer marketing businesses (Hughes, 1996).

According to Fearne and Hughes (1999) who interviewed senior executives from successful UK fresh produce companies supplying UK retailers, the most successful suppliers organise themselves to respond to their sophisticated retail customer’s needs. The key elements of these successful supplying companies are they have a strategic vision, invest in people and technology, have an organisational structure and culture, are able to measure and control costs, share market knowledge and develop innovations that integrate with their customer’s requirements (Fearne & Hughes, 1999).

### ***1.5 The locus of innovation in agri-chains***

Value chain co-innovation theory purports to have an understanding of the entire chain because value can be created in a number of places in a chain (Bonney et al., 2007; Walters & Rainbird, 2007). However, in reality, effective co-innovation can occur between just two businesses in the chain (Cox, 1999) and does not necessarily include all organisations in the chain (Meulenbergh & Jongen, 2005).

Retailers under competitive pressures are looking to suppliers to bring them new products and offers (Bonney et al., 2007; Fearne & Hughes, 2000) and typically, it is manufacturers and suppliers who have resourced and developed new food offers (Fearne et al., 2001). Retailers are not the locus of chain innovation. Supermarkets provide distribution points to consumers and do not turn supply inputs into something more valuable (Cox, 2001). Following criticism from the 2011 \$1 home brand milk campaign, John Durkan of Coles Supermarket in Australia, defended their extreme cost cutting position by saying “We started making commitments to growers so that they could invest in innovation” (Knox, 2014). The strategic position of Coles Supermarket was then, and still is today, to use their direct connections with suppliers to cut costs whilst looking to suppliers for innovative product offers.

Fewer than a third of retailers say they are currently co-innovating with a supplier (Leijnse et al., 2008) and those that are co-innovating are only doing so in 2 of the 11 identified areas: customised promotions and consumer insight (Leijnse et al., 2008). Even in areas that one would expect collaborative projects, such as the supply chain, retailer-supplier collaboration was lacking (Leijnse et al., 2008). Today in agricultural food chains, innovation is even further upstream occurring mostly in plant genomics and biotech (Stirling, 2013).

The approach taken in this study is to find participants that are currently the locus of chain innovation and exhibit value chain relational characteristics in terms of the integrity of the relationship, aligned strategies and open and bidirectional information sharing (Bonney et al., 2007). This may not necessarily include the retailer. Other co-innovation chain researchers have taken the same approach, concentrating on just two vertically integrated members of the chain because of that dyad’s strategic importance in the chain. For example



Roy et al. (2004) crafted a conceptual model of supply chain innovation within an upstream buyer-seller partnership. The upstream dyad, being where the buyer in the relationship adds value before passing it onto the next point, such as a disk-drive supplier with Dell, rather than having a relationship with the end consumer who may be unaware of the upstream innovations that have taken place within the end product. Using moderators is important in any chain relationship (such as trust, commitment and IT adoption), they argue the strategic importance of interaction between upstream buyers and sellers in that their ability to generate both incremental and radical innovations (Roy et al., 2004). Likewise, Kekre et al. (1995) modelled a supply chain comprising a supplier-manufacturer dyad suggesting it could be extended to more complex situations.

Another issue with retailer involvement is the practicalities of including retailers in supply chain research. Ada et al. (2011), for example, conducted a VCA study of Australian mangoes into UK retailers and attempted to include the retail buyers in their online survey. However, the researchers were unsuccessful in getting the retailer view. This study, despite not including retailers, is still a valuable contribution to emerging VCA working in global agricultural chains.

## ***1.6 Theoretical framework***

### ***1.6.1 The theoretical framework underpinning the investigation in this study***

Whilst reviewing the chain co-innovation literature, several themes emerged as key practices for chain collaboration. For example, Walters and Lancaster (1999) suggested the three areas which have most impact on chain collaboration are: 1) information management; 2) core activities and products and 3) relationships. In Lee et al. (2004) the authors suggest the key elements of collaboration which can be used to mitigate such effects are: 1) information sharing; 2) channel alignment and 3) operational efficiency. Fjeldstad et al. (2012) emphasise: 1) individuals being able and willing to self-organise; 2) collecting and sharing of resources and 3) protocols, process and infrastructure. Sridharan and Simatupang (2009) propose a collaboration framework comprising of: 1) decision alignment; 2) information management and 3) incentive alignment. Miles et al. (2006) identified: 1) intrinsic motivation and 2) sharing of ideas and information as the critical elements. Spekman et al. (1998) argue collaboration occurs with: 1) information sharing; 2) working

together to solve common problems; 3) joint planning and 4) interdependency. Ghoshal and Gratton (2002) from their interviews within MNCs suggest: 1) operational integration through shared technology; 2) intellectual integration through shared knowledge; 3) social interaction through shared performance and 4) emotional integration through shared identity. Ballou et al. (2000) emphasise: 1) performance metrics; 2) information sharing and 3) allocating chain benefits.

Looking at all of these constructs, three major themes emerged:

1. Individual engagement to cover the relational and knowledge related drivers that allow individual people to connect the businesses in the chain.
2. Communication as a broad term to investigate the practices necessary for information exchange.
3. Architecture as a broad term for the structures, processes and technology required for collaboration.

The following sections will discuss each of these three themes in more detail. Defining them, explaining why it is an area of interest, presenting the model that was chosen as the guiding investigative framework for each theme (Hansen & Nohria, 2004; MacCormack et al., 2007; Mohr & Nevin, 1990) and presenting the subsidiary research questions that emerged from the frameworks.

## ***1.7 Individual engagement***

### ***1.7.1 Individual engagement definition***

In this study, individual engagement is about the relational and knowledge related drivers of individuals' actions to collaborate with others. Researchers have divided information exchange engagement into two broad categories: the first being 'relational', also called 'behavioural', or the 'willingness' of individuals to act; and the second being 'knowledge', also called 'cognitive', or the 'ability' of individuals to act (Doz, 1996; Hansen & Nohria, 2004; Swink, 2006; Szulanski, 1996). In Doz (1996) observations in horizontal alliances, he noticed areas of learning difficulties between unsuccessful alliances were either behavioural (there was a disinterest or unwillingness to learn) or they were cognitive (an inability to learn). Minbaeva et al. (2014) take this a step further and suggest that when chain members

lack the motivation for sharing information, the ability for knowledge transfer is limited. Swink (2006) proposed four barriers to co-innovation which included relational barriers (such as perceived loss of power or autonomy) and knowledge barriers (such as causal ambiguity). Szulanski (1996) posits that there are four influencers in the difficulty of knowledge transfer: the source and the recipient of the knowledge transferred (behavioural) and the characteristics and the context of the knowledge transferred (cognitive). Hansen and Nohria (2004) also further divide the behavioural / cognitive distinctions into two behavioural barriers; unwillingness to seek input and learn from others and an unwillingness to help; and two cognitive barriers (inability to seek and find expertise and inability to work together and transfer knowledge).

### ***1.7.2 Why individual engagement is an area of interest***

A business' potential to innovate is influenced by its access to chain knowledge (Swink, 2006). When knowledge related to different parts of the chain is held by different people, those people need to exchange information in order for individuals to have a complete chain view (Nahapiet & Ghoshal, 1997). This knowledge exchange process requires individual engagement (Fjeldstad et al., 2012) which is why this has been included as a factor of interest in this study.

### ***1.7.3 The model guiding the investigation of individual engagement***

Hansen and Nohria (2004) framework was chosen as the guiding framework for this part of the study. Their framework was created as an explanation of how to build collaborative advantage through eliminating barriers which impact on individuals' willingness and ability to collaborate with team members. Their research was conducted in single firm, multi-unit, non-agribusiness, multinational organisations (MNCs). Whilst this model was created within a MNC context, the relevant concepts of cognitive (knowledge or ability) and relational (behavioural or willingness) drivers of individuals to collaborate with others is relevant to any team of collaborators whether they be within the same company, horizontal alliance partners, academics and industry or independent business in a vertical chain. This framework alone is unable to wholly answer the question of how collaborative practices influence co-innovation in global agri-chains. However, the construct can be used as a guide to understanding the chains' relational and knowledge drivers and how they might impact

on co-innovation. Then these insights can be used in integration with the other two constructs which investigate communication practices and organisational structures in order to address the main research problem.

#### ***1.7.4 Unwillingness to seek input and learn from others***

Some people or groups of people are not willing to learn from others, however the intent or desire to learn is a requirement for knowledge transfer (Hamel, 1991) and gaining knowledge from supply chain partners is critical to co-innovation (Schoenherr et al., 2014). In-group bias and 'Not Invented Here' (NIH) syndrome are well-known concepts (Gupta & Govindarajan, 2000) describing a group's resistance to external knowledge or ideas whilst reinforcing their own beliefs. This unwillingness to seek input and learn from others is a barrier to knowledge flows (Gupta & Govindarajan, 2000). These situations may occur for a number of reasons. It may be from a belief that the knowledge is not reliable (Szulanski, 1996). It may be ego defence where the external idea is rejected for fear that it makes themselves appear incompetent (Gupta & Govindarajan, 2000). It may be turf protection where external ideas are seen as a threat to autonomy (Swink, 2006) or it may be that the internal expectation is that they fix their own problems (Hansen & Nohria, 2004). Jassawalla and Sashittal (1998) found that collaborative managers viewed other's ideas as essential in making good decisions and that a propensity to change and the ability to adopt others ideas had a direct impact on collaborative achievement. Acknowledging this, some collaborative chains have created ways

Hansen and Nohria (2004) statements to identify the presence of the barrier, were adapted for this context as follows:

- 1. When they need help, chain members are not willing to seek input from outside their organisation.*
- 2. When faced with problems, chain members strive to solve them by themselves without asking for help.*
- 3. There is a prevailing attitude that people ought to fix their own problems and not rely on help from outside the business.*

Leading to a proposition that:

*Proposition 1: Willingness to seek input and learn from others influences the chains' abilities to successfully co-innovate.*

#### **1.7.5 Inability to seek and find expertise**

Even if the willingness to seek help is apparent, knowing who to ask may be another barrier (Hansen & Nohria, 2004). 'Prospecting' is knowing what to look for, where to look and how to access it (Santos et al., 2004). Knowing where expertise lies within a partner organization is enhanced within a value chain as members get to know each other better (Dyer & Singh, 1998). Knowledge often grows serendipitously through intercompany interactions, but some chains are improving their chances of learning by taking a systematic and concerted approach to finding new knowledge (Santos et al., 2004). An example is using organizational policies for decentralisation and transfers and mixing up teams to promote shared experience and greater interaction (Minbaeva et al., 2014). As another example, Fuji and Xerox created a 'communications matrix' detailing which individuals in which organisations have relevant expertise in key areas (Dyer & Singh, 1998). Knowledge management systems have been found to have a significant positive relationship with alliance performance (Yang, 2013) by allowing the identification, transference and assimilation of know how across organisational boundaries (Dyer & Singh, 1998).

Hansen and Nohria's (2004) statements to identify the presence of the barrier were adapted for this context as follows:

1. *Chain members often complain about the difficulty they have locating colleagues who possess the information expertise they need.*
2. *Chain experts are very difficult to locate.*
3. *Chain members have difficulty finding the documents and information they need in the company's databases and knowledge management systems.*

Leading to a proposition that:

*Proposition 2: An ability to seek and find expertise influences the chains' abilities to successfully co-innovate.*

### **1.7.6 Unwillingness to help**

The barrier to information transfer may not be at the point of the person seeking the input but instead blocked by the person that has the knowledge (Hansen & Nohria, 2004).

Empathy, as reflected by individuals values of caring and willingness to give their time and effort to the process has been identified as a key element to sustainable partner collaboration (Greer & Lei, 2012; Monge et al., 1992). If a team member is consumed with achieving individual KPIs that are focused on short-term results they may not be willing to devote their energy to something that has no direct benefit to their objectives, even if it would benefit the wider business (Hansen & Nohria, 2004) or they may feel that the rewards for sharing their expertise are insufficient for the effort involved in communicating that knowledge (Szulanski, 1996). Team members who are disinterested in the collaborative concept can also be unwilling to help, slow to respond and fast to raise objections (Jassawalla & Sashittal, 1998). The more protective chain members are of sharing information with chain partners, the less efficient knowledge transfer will be (Spekman & Davis, 2016). The protective behaviour may be due to expertise hoarding, when one partner is trying to hold power over the other, or enjoying having an information monopoly over the other and therefore may not want to give up the position of power that having that knowledge confers (Gupta & Govindarajan, 2000; Szulanski, 1996). Protective behaviour may also be because the holder feels the information is too valuable to share (Spekman & Davis, 2016) or they have a perceived loss of power or autonomy through sharing of information (Swink, 2006). Either way, this will be a barrier to knowledge flow if exploited (Kumar, 1996).

Hansen and Nohria's (2004) statements to identify the presence of the barrier were adapted for this context as follows:

1. *Chain members keep their expertise and information to themselves and do not want to share it across boundaries.*
2. *Chain members do not share their expertise and information for fear of becoming less valuable.*
3. *Chain members seldom return phone calls and emails when asked for help.*

Leading to a proposition that:

*Proposition 3: Willingness to help influences the chains' abilities to successfully co-innovate.*

#### **1.7.7 Inability to work together and transfer knowledge**

A final engagement barrier to knowledge transfer is the ability for external knowledge to be articulated and absorbed. The problem may not be in the willingness of the two people working together but in the lack of understanding of each other (Gupta & Govindarajan, 2000; Hansen & Nohria, 2004). 'Absorptive capacity' refers to when there is a lack of ability to recognise, assimilate and apply relevant information (Cohen & Levinthal, 1990). Such lack of capacity is usually due to insufficient prior knowledge manifesting in an inability to exploit external information successfully to a commercial reality (Szulanski, 1996). The less familiar the partners are with each other's competencies, the more difficult knowledge transfer will be (Spekman & Davis, 2016). The more a partner is behind, the more they need to learn, but the harder it is for them to keep up (Hamel, 1991). 'Causal ambiguity' may occur when knowledge is difficult to explain (Swink, 2006) such as tacit knowledge (as opposed to explicit knowledge) because it is often kept within the company's people and practices making it difficult to be codified (Spekman & Davis, 2016).

A second part of this barrier is when the people communicating don't feel comfortable with each other. This may be due to a stranger problem (Hansen & Nohria, 2004) or an arduous relationship (Szulanski, 1996). A further consideration, particularly in this context of global chains, is that different cultures, social norms and languages may also affect the ease of information transfer (Gupta & Govindarajan, 2001; Swink, 2006). Strong cohesive relationships are associated with higher chain collaboration performance (Warkentin et al., 1997), facilitate communication and information exchange (Larson & LaFasto, 1989), and are positively related to an organizational culture skilled at creating, acquiring and using new knowledge and developing insights (Barczak et al., 2010; Joo et al., 2012).

Szulanski's study (1996) found that the biggest internal knowledge transfer barriers to be knowledge-related factors such as the recipient's lack of absorptive capacity, causal ambiguity or an arduous relationship between the source and the recipient.

Hansen and Nohria's (2004) statements to identify the presence of the barrier, were adapted for this context as follows:

1. *Chain members have not learned to work together effectively to transfer tacit knowledge.*
2. *Chain members are not used to working together and find it hard to do so.*
3. *Chain members find it difficult to transfer complex technologies and best practices.*

Leading to a proposition that:

*Proposition 4: An ability to work together and transfer knowledge influences the chains' abilities to successfully co-innovate.*

## **1.8 Communication**

### **1.8.1 Communication definition**

Communication is the transference of information (Mohr & Spekman, 1994). The word 'transfer' is used to emphasize that knowledge is actively imparted and received, rather than a gradual process of dissemination (Szulanski, 1996) or an accidental diffusion.

### **1.8.2 Why communication is an area of interest**

Communication is considered to be the glue that holds a chain together (Mohr & Nevin, 1990). It is fundamental to creating relationships (Mohr & Sohi, 1995), essential to collaboration (Mohr & Spekman, 1994) and a driving force for innovation (Ebadi & Utterback, 1984). Collaborative chains view information sharing as an asset (Spekman & Davis, 2016). Therefore communication is included as a factor of interest in this study. There is a significant body of empirical studies which have investigated various constructs of communication and their impact on innovating teams (Ebadi & Utterback, 1984; Kratzer et al., 2004; Monge et al., 1992) and collaborating or integrated teams (Frazier & Summers, 1984; Gratton & Erickson, 2007; Hunt & Morgan, 1994; Kumar, 1996; Mohr & Spekman, 1994).

These and other studies have examined how partnerships communicate with constructs such as the frequency of communication between partners (Ebadi & Utterback, 1984;



Kratzer et al., 2004; Monge et al., 1992), the mode or method used to transmit information (Barry & Bateman, 1992; Daft & Lengel, 1986), and the formality of the communication (Ebadi & Utterback, 1984; Hunt & Morgan, 1994).

Another theme of partnership communication is how power plays out in partnership communication, which is pertinent to this study since there is a retail/supplier power imbalance which is evident in agri-chains (Knox, 2014). Variables in this area have included the level of openness and honesty in which information is shared (transparency) (Fawcett et al., 2011; Simatupang & Sridharan, 2008); if both parties are willing to participate in the information exchange (bidirectionality) (Kumar, 1996; Mohr & Sohi, 1995; Mohr & Spekman, 1994) and if indirect or direct influence strategies are used (Frazier & Summers, 1984; Kumar, 1996).

### ***1.8.3 The model guiding the investigation of communication***

Mohr and Nevin's (1990) theoretical model on communication strategies in marketing channels was used to explore how the communication practices used by these chains might influence co-innovation in these chains. This model was selected as the guiding framework for this study because not only did it consider how communication occurred (frequency and mode), and the power influences on communication (influence strategies, transparency and bidirectionality) but also what the partners were communicating (content). The framework also aimed to align communication strategies of frequency, direction, modality and content with channel conditions of structure (relational vs market), climate (supportive vs unsupportive) and power (symmetrical vs asymmetrical). They posit that relational, supportive and symmetrical relationships will communicate with high frequency, bi-directionality, informal modes and indirect content (Mohr & Nevin, 1990). The model has been extended to manufacturing and service industries (Peters & Fletcher, 2004) however, as far as I'm aware, the model has not been applied to chains or an agricultural context until now. This framework alone is unable to wholly answer the question of how collaborative practices influence co-innovation in global agri-chains. However, the construct can be used to guide the understanding of the chains' communication practices and how they might impact on co-innovation. Then these insights can be used in integration with the other two

frameworks which investigate engagement and organisational structures in order to address the main research question.

#### **1.8.4. Frequency**

Frequency refers to the amount of contact between the partners (Mohr & Nevin, 1990).

There are a number of studies of innovating teams that have found higher levels of communication, information flow and knowledge sharing are important for the innovation process (Ebadi & Utterback, 1984; Kanter, 2004; Monge et al., 1992) because greater levels of communication provide people with more information which allows more opportunity to make new connections (Monge et al., 1992). There is some divergence in thinking around the connection between increased communication and trust. Yoo et al's (2014) study between Korean sales people and their managers did not support the view that greater levels of communication leads to increased trust. However, Anderson and Weitz (1989) found that not only did increased communication lead to greater trust, but greater trust also led to a higher frequency of communication. High communication frequency has also been linked with higher perceptions of communication quality (Mohr & Sohi, 1996), cooperation (Anderson & Narus, 1990), and commitment (Hunt & Morgan, 1994).

*Proposition 5: Communication frequency influences the chains' abilities to successfully co-innovate.*

It has also been suggested, however, that too much communication can lead to negative consequences where chain members can feel overloaded by information (Mohr et al., 1996), and in terms of innovation, creativity in teams can decrease due to members feeling that they don't need to closely evaluate the information or contribute because other members are doing the work for them (Kratzer et al., 2004). Therefore in assessing communication one needs to assess more than just the amount but also the adequacy or satisfaction with that level of communication (Mohr & Nevin, 1990). Mohr and Sohi (1996) found a link between high communication satisfaction and communication quality which the authors define as completeness, credibility, accuracy, timeliness and adequacy, or in other words, does the information communicated fulfil the needs and requests of the recipient (Steele &

Plenty, 2015). Communication quality has been linked to perceived innovativeness, particularly in highly complex or difficult tasks (Johnson et al., 2001).

*Proposition 6: The satisfaction of communication frequency influences the chains' abilities to successfully co-innovate.*

#### **1.8.5 Direction**

Direction refers to the directional movement of information flows between businesses within the chain. Bi-directional flow is the extent to which the information moves both ways between partners as they give feedback and input into each other's businesses (Mohr & Sohi, 1996). A long term buyer-seller relationship is unlikely to be created without a bilateral directional flow of information (Dwyer et al., 1987; Mohr & Nevin, 1990) and in terms of innovation, diversity of information and input from different businesses and perspectives in the chain is ideal in order for new connections to be made (Santos et al., 2004; Zhang et al., 2010). Furthermore, if a partner can't ask questions or get a full explanation for a decision or action then this may lower the partner's trust in the information (Kumar, 1996; Mohr & Sohi, 1996; Yoo et al., 2014).

*Proposition 7: Communication directionality influences the chains' abilities to successfully co-innovate.*

Transparency is purposively making available information of concern (Cotterrell, 1999). Not only is an open and honest dialogue considered a sign of a healthy, interdependent relationship (Kumar 1996) but the better the visibility of each activity in the chain, the more effective each chain partner can be in making decisions (Simatupang & Sridharan, 2008). Open communication and information exchange builds a collaborative culture (Gratton & Erickson, 2007), perhaps because routine open sharing where transparent information flow is the norm (rather than being restricted to transparency about a specific area) leads to collaboration in the chain also becoming a normal chain practice (Grams, 2012). Sharing diverse information that chain partners can contribute from their different positions within the chain is good for innovation (Bercovitz & Feldman, 2011; Santos et al., 2004; Zhang et al., 2010). However, there can often be a tension between the need to communicate

transparently to integrate knowledge for co-innovation and the fear of that information being used for opportunistic behaviour (Jarvenpaa & Välikangas, 2014).

*Proposition 8: Communication transparency influences the chains' abilities to successfully co-innovate.*

### **1.8.6 Modality**

Modality describes the way in which information is imparted (Mohr & Nevin, 1990). Daft and Lengel (1986) introduced the notion of different modes (or mediums) of communication varied in richness based on their ability to convey meaning by way of social cues and emotion. Face-to-face being considered the richest mode of communication, followed by video conferencing, email and so on right down to a formal, unaddressed documents (Daft & Lengel, 1986). Since Daft and Lengel (1986) first published their hierarchy of communication, conference call technology has become more sophisticated and 'concalls' are now part of usual business practice in international supply chains. However, today there is still strong support for face-to-face communication trumping computer-mediated-methods in terms of the face-to-face communication being a stronger choice for creating unity, building trust and managing crises (Katz, 2015).

A richer mode of communication is also believed to be more important when a more complex, technical or ambiguous message is being communicated (Daft & Lengel, 1986). Where the complexity of both the market and technical transfer are low, then arms-length data is sufficient (Santos et al., 2004) as the complexity in either increases, moving people closer to the technical on farm knowledge or market knowledge will be necessary (Santos et al., 2004).

The theory of hierarchical richness, however, doesn't have universal support. Barry and Bateman (1992) found in their empirical study that the phone might be the most critical medium due to the mode's ability to be both flexible and highly capable of transmitting information. Warkentin et al. (1997) found that there was a similar level of communication effectiveness between face to face meetings and that of virtual teams, however, they found

that face to face groups reported more cohesiveness and satisfaction in group decisions and outcomes than groups of virtual teams.

*Proposition 9: Communication modes influence the chains' abilities to successfully co-innovate.*

Modality can also be classified in terms of formality which is the categorisation that Mohr and Nevin (1990) used in their framework. Formal modes are structured, planned, routine and regular whilst informal modes are spontaneous and casual (Mohr & Sohi, 1995). In terms of innovation, some research suggests there should be a mix of formal and informal connection points (Hunt & Morgan, 1994). Others believe that high formality has a negative effect on innovation (Ebadi & Utterback, 1984) and informal, organic communication leads to better innovation (Olson et al., 1995). Others still, suggest that the absence of formal meetings may slow participant contributions to innovation processes (Monge et al., 1992).

*Proposition 10: The formality of communication influences the chains' abilities to successfully co-innovate.*

### **1.8.7 Content**

Content is about the message transmitted (Mohr & Nevin, 1990). One way to view content is through indirect versus direct influence strategies (Frazier & Summers, 1984). Direct content is when the speaker communicates a specific action that the speaker wants the recipient to take. It may be framed as a request, or in a stronger manner such as threat, promise or appeal to a legal obligation. When a speaker uses indirect communication, there is no specific action requested with the information exchange (Frazier & Summers, 1984). Indirect information exchange was a better choice for a collaborative business partnership (Frazier & Summers, 1984; Kumar, 1996) as it is more likely to build trust (Yoo et al., 2014) and lead to agreement (Kumar, 1996). However, indirect communication consumes more time and requires more effort to be effective than giving direct orders (Frazier & Summers, 1984).

*Proposition 11: Influence strategies affect the chains' abilities to successfully co-innovate.*

Content can also be categorised based on the type of information exchanged (Mohr & Nevin, 1990). Tacit knowledge is that which is difficult to explain with words (Polanyi, 1967) since it is uncodifiable knowledge embodied in the people and practices of the company (Spekman & Davis, 2016). Explicit knowledge is much clearer and easier to transmit. This includes knowledge of such issues as inventory, product characteristics, pricing and promotions (Gross, 1968). Whilst it is recognised that explicit and tacit knowledge are complementary (Nissen et al., 2014; Park et al., 2015) sharing explicit knowledge doesn't require a close interaction between partners (Nissen et al., 2014). Explicit knowledge is critical for coordination (Gross, 1968). For collaborative innovation however, chain partners require a much closer understanding of each other's views which requires the sharing of tacit knowledge (Nissen et al., 2014) and has the potential to deliver sustained competitive advantage (Park et al., 2015).

*Proposition 12: The type of knowledge shared influences the chains' abilities successfully to co-innovate.*

## **1.9 Architecture**

### **1.9.1 Architecture definition**

The term architecture is increasingly used in business terms to describe organisational structures (Fjeldstad et al., 2012). Effective businesses recognise the need to organise themselves to fit the purposes they have set out to achieve (Fjeldstad et al., 2012). Collaboration of any kind cannot occur without supporting structures and processes (Ketchen et al., 2007).

### **1.9.2 Why architecture is an area of interest**

We know from existing empirical research that business architecture impacts innovating teams (Hansen et al., 1999; Olson et al., 1995), collaborating teams (Gulati & Nickerson, 2008) and even within co-innovating teams (Bercovitz & Feldman, 2011; Bossink, 2002; Jassawalla & Sashittal, 1998; MacCormack et al., 2007; Owen et al., 2008). Business architecture impacts collaboration in MNCs (Ghoshal & Gratton, 2002; Hansen & Nohria, 2004), in horizontal alliances (Doz, 1996) and between research institutions (Bruns, 2013). It

has been found that the most successfully co-innovating chains have a mindset for co-innovation and have developed an explicit co-innovation strategy. In designing the chain's architecture the chain needs to identify and implement the required structures in order to reach collaborative objectives (Simatupang & Sridharan, 2008). The chain needs to invest in co-innovation capabilities and organise themselves for the task, making organisational changes and creating processes, platforms and programs to support their efforts (MacCormack et al., 2007).

### ***1.9.3 The model guiding the investigation of architecture***

To explore chain architecture and its possible effects on chain potential to co-innovate, this study uses MacCormack et al. (2007) proposed framework from a Harvard Business School Working paper that described the results of studying of over 100 managers from 20 businesses that were making extensive use of collaboration in their innovation efforts. The paper references high-tech industry-heavy-weights such as Microsoft, Boeing, Siemens, TransCo, a leading transportation firm; NewCo, a company that sells servers to the likes of HP and Sun; and SemCo, an electrical component manufacturer (2007). The authors proposed 'Four Pillars of Collaborative Capabilities' namely; people, process, platform and program. This model nicely encapsulates the relevant concepts of business structures that are commonly identified as those that impact co-innovation. This framework alone is unlikely to wholly answer the question of how collaborative practices influence co-innovation in global agri-chains. However, the framework can be used to understand the chains' architecture and how they might impact on co-innovation. Then, these insights can be integrated with the other two constructs which investigate engagement and communication to answer the main research question.

### ***1.9.4 People***

Co-innovation activities are not performed by organisations but by people. The individuals that connect the two businesses will have a major impact on the success of the partnership (MacCormack et al., 2007). Often, job functions, recruitment, responsibilities, leadership, performance measurements, reward and recognition, and training will need to be altered to include collaboration for innovation (Owen et al., 2008) as well as how the collaborating

team that defies the boundaries of the company are managed and structured to best allow them to work together (MacCormack et al., 2007).

Actively recruiting a group of people who will be able to collaborate in their work is critical (Hamel, 1991; Hansen & Nohria, 2004) which means recruitment criteria are needed that look beyond technical skill and consider the individual's ability (Hamel, 1991) and interest in working collaboratively (Hansen & Nohria, 2004; Jassawalla & Sashittal, 1998).

Management should also actively encourage and manage co-innovation (Bossink, 2002; MacCormack et al., 2007) and communicate the strategic direction of the collaborative partnership (Hamel, 1991; Jassawalla & Sashittal, 1998; Owen et al., 2008). Buyer-supplier relationships have traditionally been managed with the more powerful buying business encouraging employees not to have personal ties with their suppliers with the mindset that this will make it easier for them to push for better prices. A buyer's Key Performance Indicators (KPIs) are often based around price, volume and other short term metrics (Kumar, 1996). Co-innovating team management, however, should encourage personal ties so that trust can be built, KPIs should reward desired relationship behaviours and collaborative activities (Kumar, 1996). Likewise promotion should go to managers who demonstrate collaborative behaviours (Hansen & Nohria, 2004).

Another important concept is that of having a number of 'gatekeepers'. Gatekeepers are the people who connect the internal team to the external domains (Tushman & Katz, 1980). Chain effectiveness can be improved with cross domain exposure (Bercovitz & Feldman, 2011; Bruns, 2013; Hansen & Nohria, 2004). Beyond shadowing, chains can use workshops and mini courses to convey information, standardise terminology and explain priorities (Bruns, 2013). Regularly occurring interaction can also allow chain members to get to know each other better and form professional relationships (Hansen & Nohria, 2004). These kind of boundary spanning activities have been found to increase innovation proposals (Aiken et al., 1980) and boundary spanning teams with social ties are more successful in generating patents, licenses and royalties (Bercovitz & Feldman, 2011). High centralisation is negatively associated with knowledge sharing (Ebadi & Utterback, 1984; MacCormack et al., 2007; Olson et al., 1995; Tsai, 2002).



Continuity of gatekeepers is important but there's a balance between continuity and widening the number of people involved (Doz, 1996). Collaboration was lower in businesses where senior management viewed themselves as the primary decision makers, and other team members as those who implement the projects (Jassawalla & Sashittal, 1998). In research on high-tech collaborative businesses, all participants were boundary spanners (Jassawalla & Sashittal, 1998). Businesses with less complexity can have fewer people with gatekeeper responsibilities (Tushman & Katz, 1980) but this means lower level team members don't have the same opportunities to be involved in collaborative projects as senior management (Warkentin et al., 1997). This is important because when it's always the same people working together mental models become internalised and co-innovation diminishes because projects are not insulated from the baggage of the team's history (Skilton & Dooley, 2010). Idea generation is about bringing together diverse ideas to stimulate a novel solution (Bercovitz & Feldman, 2011; Santos et al., 2004; Skilton & Dooley, 2010).

Statements to identify the presence of this capability were drawn from the literature as follows:

1. *Chain members are recruited for their co-innovation skills.*
2. *Chain members are encouraged by leadership to co-innovate.*
3. *KPIS encourage and reward co-innovation.*
4. *There are multiple gatekeepers connecting the chain.*
5. *Cross boundary relationships are cultivated amongst chain members.*

Leading to a proposition that:

*Proposition 13: The structuring of people influences the chains' abilities to successfully co-innovate.*

### **1.9.5 Processes**

Organisations that innovate internally have often adopted or developed an innovation process. Popular examples include: stage and gate (Grönlund et al., 2010), pipeline (O'Brien, 2014) and cascading (Kaafarani & Stevenson, 2011). Whilst no single best approach to the process of co-innovating has been found there are a few common themes. Successful chains

have innovation processes (Bruns, 2013; Wilson & Doz, 2012) and team members can describe those processes (Simatupang & Sridharan, 2008). However, co-innovation processes shouldn't be over-engineered or too formal or the process itself can stifle the diversity of thinking and novelty required for innovation (Bruns, 2013; Olson et al., 1995; Wilson & Doz, 2012). The processes should also follow a learning approach with pilot runs of ideas to test concepts before roll out on successful trials (MacCormack et al., 2007) so that co-innovation skills can be honed (Wilson & Doz, 2012) and the chain improved over time (MacCormack et al., 2007; Owen et al., 2008). Each process step should have clear process owners assigned depending on core competencies (Adam et al., 2005).

Statements to identify the presence of this capability were drawn from the literature as follows:

1. *There are formal joint processes to coordinate co-innovation projects across the chain.*
2. *There are informal joint mechanisms for co-innovation projects across the chain.*
3. *The chain conducts testing and pilot runs with a learning approach (feedback loop),*

Leading to a proposition that:

*Proposition 14: Chain processes influence the chains' abilities to successfully co-innovate.*

### **1.9.6 Platforms**

MacCormack et al. (2007) found the most successful co-innovating organisations use platforms to better coordinate the collaborative work and these platforms weren't specific to a single project. There are four main areas in which leading businesses develop these platforms: technology to improve efficiency, knowledge management systems, rules to govern the collaboration and technical standards to ensure seamless data transfer (MacCormack et al., 2007).

Successfully co-innovating chains use integrated technology to coordinate activities, eliminate duplication and errors, and build chain competencies to deliver customer value (Ghoshal & Gratton, 2002; Hammer, 2001; Owen et al., 2008). Strongly collaborating chains such as Amazon, Wal-Mart, Honda and Dell have used joint technology to allow chain

members to collate and share data in real time thus improving supply chain performance (Fawcett et al., 2011). In terms of co-innovation MacCormack et al. (2007) gave examples of a company connecting over 50 global partners in an engineering project and requiring an integrated platform to do so. The same authors also showed what lack of integration of technology can do with the example of the Air Bus A380 project, where German and French engineers used different design software which didn't integrate resulting in a 2 year delay costing \$6 billion (MacCormack et al., 2007).

Knowledge management systems allow the identification, transference and assimilation of know how across organisational boundaries (Dyer & Singh, 1998; Owen et al., 2008; Yang, 2013). Knowledge management systems can be codified, where information on relatively standardized products can be coded, stored and accessed to be used over again by anyone in the organisation; or personalised, where information on highly customised products is shared mainly through person-to-person contacts (Hansen et al., 1999).

Technology and knowledge systems that span business boundaries require project management, financial and IT support (Ghoshal & Gratton, 2002; Gunasekaran & Ngai, 2004). Any shared data needs to be processed in a timely manner, updated, coordinated and controlled (Gunasekaran & Ngai, 2004) and integrated with the overall business strategy (Ghoshal & Gratton, 2002). The purpose of such systems, how they will deliver value and how they will be resourced needs to be agreed to across the chain and weighed against the investment (Fawcett et al., 2011). Whilst joint technologies have the capability of creating a collaborative environment and improved communication between geographically distant partners, these technologies may end up being an expense that fails to reap anticipated benefits if not used in the right way (Fawcett et al., 2011; Ghoshal & Gratton, 2002). They may even be worse than an expense as they may hinder cohesion, interaction and rapport (Warkentin et al., 1997). Barratt (2004) goes as far as to suggest that an over reliance on integrated technology has been one of the reasons why chain collaboration has not been widely adopted.

In terms of contracts and governance, the most successful chains were less detailed in their contracts with each other (Kumar, 1996; MacCormack et al., 2007; Wilson, 1995). Instead,

the most successful chains were guided by trust and goodwill (Dyer & Singh, 1998; Gulati & Nickerson, 2008) and shared expectations of acceptable behaviour (Tuusjärvi & Möller, 2009). The advantages of collaboration outweigh the need for control (MacCormack et al., 2007) and strong collaborative relationships have been found to be a more effective and less costly way of safeguarding the business than more formal legal mechanisms (Gulati & Nickerson, 2008). Lastly, joint technical standards provide a commonality to enable smooth integration between the businesses (MacCormack et al., 2007).

Statements to identify the presence of this capability were drawn from the literature as follows:

1. *There are knowledge management systems to capture, transfer and assimilate chain knowledge across organisational boundaries.*
2. *There is joint technology to improve efficiency across the chain.*
3. *There are shared expectations rather than long, detailed formal contracts to govern the collaboration.*
4. *There are joint technical standards to ensure seamless data transfer.*

Leading to a proposition that:

*Proposition 15: Chain processes influence the chains' abilities to successfully co-innovate.*

### **1.9.7 Programmes**

The most successful collaborative chains run co-innovation programmes as opposed to one off projects (MacCormack et al., 2007). The most successful co-innovation programs have a senior person tasked with shaping the program (but not necessarily directly involved in the projects) and with managing the learning and continuous improvement of the organisations co-innovation skills (MacCormack et al., 2007). The program discussions should include; strategic chain alignment (Alexander & Van Knippenberg, 2014), efficient chain coordination (Jassawalla & Sashittal, 1998), information sharing so that the individual businesses may take actions with greater visibility (Simatupang & Sridharan, 2008), have sufficient flexibility and informality to allow people to make quick connections (Kanter, 2011) and they should be set up for the long term (Walters & Rainbird, 2007).

Statements to identify the presence of this capability were drawn from the literature as follows:

1. *There are co-innovation programs set up in these chains.*
2. *There is a senior person (people) tasked with shaping the program.*
3. *The co-innovation program set up for the long term.*

Leading to a proposition that:

*Proposition 16: Chain programs influence the chains' abilities to successfully co-innovate.*

### ***1.10 How these frameworks might fit together***

To this point in the literature review, the primary area of interest (co-innovation in value chains), the research context (agribusiness) and why it is a challenge for agribusiness to adopt co-innovation have been discussed.

In section 1.6 of the literature review, I presented literature that suggests various factors for collaborative success. From those studies I identified three common themes; 1) the need for relational and knowledge drivers (which I'm calling 'engagement'); 2) the importance of information exchange (which I've broadened to 'communication'); and 3) the required structure and processes for collaboration (which I've termed 'architecture'). In order to ensure these three important themes are covered in my research, I chose three corresponding frameworks as guides; 1) Hansen and Nohria's (2004) Four Barriers of Collaboration; 2) Mohr and Nevin's (1990) Communication Strategies for Marketing Channels; and 3) MacCormack et al's (2007) Four Pillars of Collaborative Capacity. These chosen guiding frameworks are well-constructed models which can provide insight into the area for which they were chosen. However in their selection I also considered how they might fit together in order to offer some insight into how these themes might integrate. It is the integration of these constructs which I believe is the greatest contribution of this work.

Whilst there has been research conducted in co-innovating groups moderated by each of the elements within the themes, Barratt (2004) questions if researchers are yet clear on how the elements of co-innovation might fit together. The majority of the studies and theories have focussed on the moderating elements in isolation, however for those authors

who offer theories on how some of the elements might integrate there is much disagreement. For example, Hackman (2009) say that team engagement and cohesiveness comes before co-ordination and performance, however Jassawalla and Sashittal (1998) believe that a partnership attains co-ordination before synergy among chain members is achieved. Anderson and Narus (1990) argue that cooperation is an antecedent of trust, but Hunt and Morgan (1994) argue the other way, that it is trust which builds cooperation.

A thorough search of the scientific literature on the topic revealed no comprehensive chain co-innovation construct which incorporates all of these themes in an integrated manner, however, there are some studies, that can offer some hints of how these themes may fit together. For example, Fjeldstad et al. (2012) proposed a scheme for collaboration which was derived from work done in the global professional services, open source software, computer equipment and national defense sectors. The authors' framework comprises three elements: 1) individuals being able and willing to self-organise; 2) collecting and sharing of resources; and 3) protocols, process and infrastructure (Fjeldstad et al., 2012). From this framework, Fjeldstad et al. (2012) claim that infrastructure allowed employees to connect and share information; that self-organising employees use protocols to coordinate activities.

Sridharan and Simatupang (2009) tested three hypothesis of collaboration: 1) information sharing; 2) decision synchronising; and 3) incentive alignment and concluded that both information sharing and decision synchronising improve collaboration through better coordination.

The model that comes closest to an integrated co-innovation model for agri-chains is the value chain innovation roadmap suggested by Bonney et al. (2007). Of note, this model was developed in a national chain, and not a global agri-cultural chain, however it is a useful reference point to sense check the use of the frameworks I've chosen to integrate for this study and begin to understand how the constructs might work together. In Bonney et al's (2007) framework, the authors suggests that culture, vision and leadership shape structures and processes, which interplay with drivers of action (such as ability and motivation) to create opportunities for co-innovation.

It is also important to note, that different practices may be appropriate for chains in different market structures (Hansen & Nohria, 2004), at different stages of the alliance (Doz, 1996) and with different governance structures (Mohr et al., 1996). Collaborators engage in iterations of learning cycles and trust and commitment consequently build over time (Doz, 1996) and so the characteristics of the collaboration will also change over time (Nidumolu et al., 2014). For this reason, it is suggested, that the outcome of this study may present a framework where the themes have considerable cross-over and are looped together.

### **1.11 Literature review summary**

This chapter has presented the literature relevant to the question:

*‘How collaborative practices influence a global agri-chain’s capability to co-innovate?’*

The chapter first defined and discussed the key areas of ‘co-innovation’ and ‘value chains’ (1.2). Section 1.3 then justified the importance of studying agricultural value chains due to how critical effective and efficient agricultural supply chains are to feeding the world’s growing demands for food. A background of agricultural supply chains was then provided with special consideration given to the nuances and challenges of agricultural chains that make it difficult for the sector to adopt co-innovation and value chain thinking (1.4) and why the locus of innovation is between an integrated upstream grower/shipper and an in market food company (1.5)

In reviewing the body of chain co-innovation literature this chapter outlined three important themes that are used as a theoretic framework for this study of co-innovation in the agribusiness context (1.6). The three themes are namely, individual engagement (1.7), communication (1.8) and architecture (1.9). Sixteen propositions were presented as part of the thematic review. Finally, in section 1.10, I consider possible outcomes for how these themes might fit together in the agri-business context. The way is therefore open for the presentation of the case studies findings in chapter 4 and a discussion in reference to this literature review in chapter 5.

## **Chapter 2: Research Design and Method**

### ***2.1 Introduction***

This chapter details the research design and methods used to investigate how collaborative practices influence a global agri-chain's capability to co-innovate. Recognising that there are multiple perspectives of reality in experiencing co-innovation, an interpretive qualitative case study approach was used. The basis for this research approach is outlined in 2.2.

Both the project design and the structure of most of this chapter follow Rosenberg and Yates' (2007) schematic for case study design in order to provide rigour and procedural clarity. The structure is as follows: posing the research question (2.3.1), identifying the theories and themes underpinning the study (2.3.2), determining the research context (2.3.3), selecting the specific cases (2.3.4), determining the data collection methods and how the data were analysed, refined and reduced (2.3.5 – 2.3.8); and finally, how conclusions were drawn and theory developed (2.3.9). How the validity and reliability of the project were optimised through research design and method is also detailed at the end of the chapter (2.4)

### ***2.2 Research design approach***

The purpose of building a philosophical base of a study is so it can act as a spring board that offers guidance to designing a methodologically congruent project (Mason, 2002; Morse & Richards, 2002). The approach chosen should be 'pro-meaningfulness' (Patton, 1999) and fit with the researchers own world view, purpose of research and the nature of the question to be answered (Merriam, 2014). To gain meaningful insight and appropriate fit with the purpose and nature of this project, this study requires a research approach that can guide an investigation and interpretation of the multiple perspectives of reality of value chain members experiencing co-innovation. For this reason, an interpretive qualitative approach was used.



### ***2.2.1 The basis for an interpretive approach***

An interpretive view, also called a 'constructivist' paradigm because of the view that reality is socially constructed (Merriam, 2014), is about people's views and understandings both individual and collective (Mason, 2002). It is about exploring the way people subjectively interpret the meaning of events, situations and motivations of people's actions (Lewis-Beck et al., 2004; Saunders et al., 2003). An interpretive paradigm recognises that there is no one single worldview, but multiple perceptions of reality (Merriam, 2014). The approach is particularly advantageous in studying social and business management phenomena because it allows for the complexities of the social and business world not to be lost in 'law-like generalisations' often applied in physical sciences (Saunders et al., 2003). It also allows the researcher to capture and represent participant's experiences within a real life context (Yin, 1981).

Congruent with an interpretive position is qualitative inquiry (Merriam, 2014). A key advantage of employing a qualitative approach is that it produces deep and detailed information from a small number of cases (Patton, 1990). Qualitative research is particularly good for unveiling the complexity of real life contexts, (Miles & Huberman, 1994) finding meaning from that context (Merriam, 2014) and examining how and why things happen (Yin, 2009). Although small samples make generalisation more difficult to defend it does increase understanding about what is being studied (Patton, 1990). In an interpretive qualitative research project we're not measuring or testing anything, we're discovering and describing experiences (Merriam, 2014).

### ***2.2.2 The basis for a case study approach***

A case study approach is consistent with an interpretive ontological position (Burrell & Morgan, 1979) in that the objective of a case study is to capture and represent participant's experiences within a real life context (Yin, 1981). Case studies are commonly used in social science and organisational research (Kohlbacher, 2006) and since the research phenomenon of this project is current and requires collecting and interpreting people's own experiences and views, a case study approach is an obvious choice for this project.

Using a case study strategy for this project provides several benefits to this work:

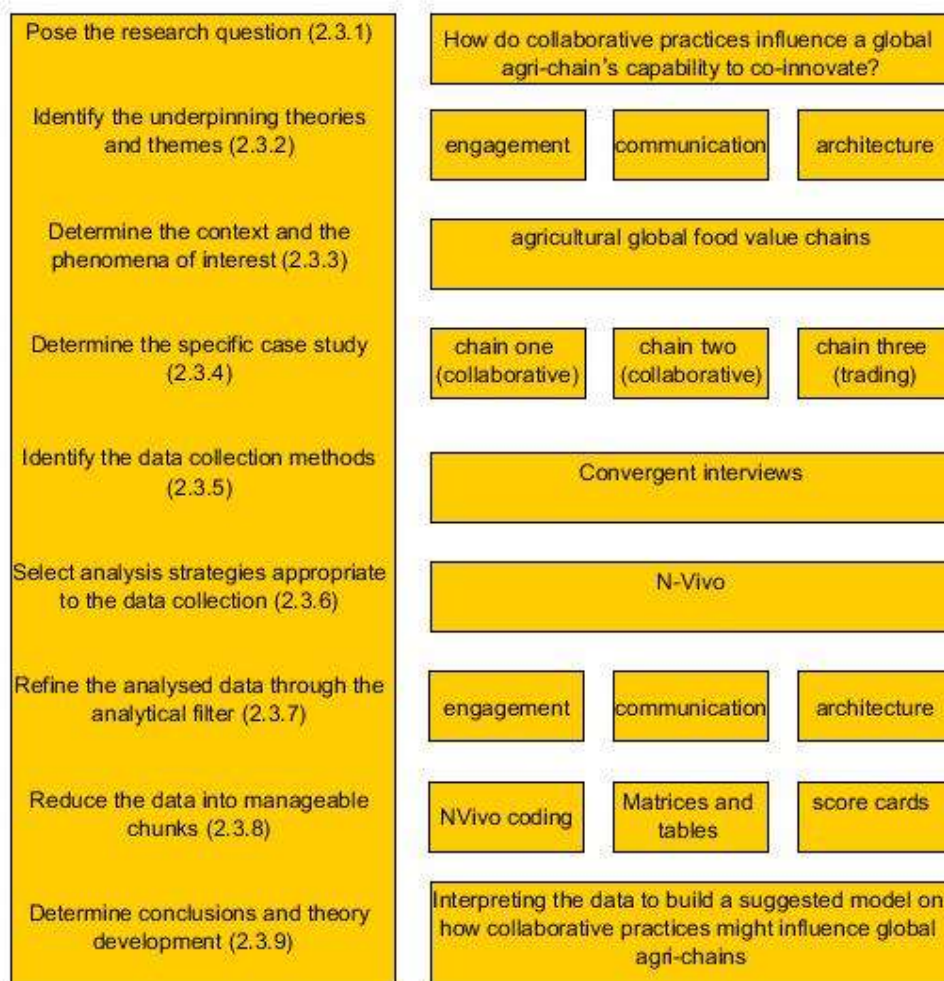
- Case studies are great for investigating complex social structures, such as value chains, as they can handle multiple variables (Rosenberg & Yates, 2007)
- Case studies are useful to gain deep, rich and holistic accounts of real life contexts (Patton, 1990)
- Case study knowledge is so vivid that readers can bring their own experience and understanding to the data so that readers can participate in the extension of ideas (Merriam, 2014)
- Case study insights can be used to construct hypotheses for future research and as such this research approach plays an important part in advancing the area of interest (Merriam, 2014)
- Whilst these case studies cannot produce valid predictions of causal factors they might give us an indication of what may be relevant in other cases.

### ***2.3 Research design***

The research design is a blueprint, guiding the activities of the project to ensure that the research question is completely addressed (Bickman & Rog, 2009). Good research design is critical for the study's validity, ability to draw conclusions and the likelihood of the project being accomplished (Bickman & Rog, 2009).

Both the project design and the structure of the remainder of this chapter, follow Rosenberg and Yates (Rosenberg & Yates, 2007) research methodology schematic for case studies (figure 1). This schematic is not only useful procedurally but it also provides a visual representation of how the elements fit together (Rosenberg & Yates, 2007). Whilst this section has been written in a linear fashion from posing the research question, and identifying themes, data collection, analysis and interpretation, in practice there is some overlap and cycling back through the steps (Merriam, 2014).

**Figure 1: Research method overview structured using Rosenberg and Yates' (2007) schematic representation of case study research designs**



### **2.3.1 Pose the research question**

All research should start with a well formulated question (Rosenberg & Yates, 2007). This is a critical step in the research process because of its influence on successive steps (Van de Ven, 2007). If the problem hasn't been clearly defined at the start of the project then a lot of time can be wasted on irrelevant work and the likelihood of success is much lower (Saunders et al., 2003).

Merriam's (2014) first suggestion for selecting a qualitative research topic is to look at your own daily life. In areas of applied practice, the vast majority of research topics are derived from personal interests (Merriam, 2014) which is also how this project came about. I have

been involved in the fresh produce industry since 2003 with a range of responsibilities including exporting from both New Zealand and Australia to a number of countries through various channels: from wholesale markets to centrally coordinated buying groups and direct to large retailers. I've provided category management to key retail customers, coordinated collaborative grower groups, participated in industry research, coordination and marketing projects, managed sales teams, worked on supply chain projects and developed and launched new products.

I was first introduced to the concepts of 'value chains' and 'co-innovation' by Ray Collins, who was a Professor at the University of Queensland who took a particular interest in agricultural value chains. The presentation was to a small number of employees at the company I worked at. The company was extraordinarily transparent with collaborative grower groups and customers alike, invested in consumer research, invested in growing and marketing proprietary branded product and both 'collaboration' and 'innovation' were pillars of our practice even though those terms weren't part of the company vernacular. Whilst the value chain and co-innovation concepts were a good fit with our existing company culture, I wondered how this area of research could improve our co-innovative capabilities to gain a competitive edge. I wondered what was considered best practice for co-innovation in agri-chains and I wondered how we might be able to adopt those practices, yet, upon searching for answers I found that co-innovation in global agri-chains was relatively unexplored territory which eventually led me to forming my research questions for this Ph.D project.

In developing a clear research question the researcher needs to get from an area of general interest to a clear and specific researchable problem (Merriam, 2014). Throughout the literature review stage I narrowed my broad interest of the agri-chain co-innovation phenomenon and after a series of modifications the nature of the problem was eventually clarified to:

*'How do collaborative practices influence a global agri-chain's capability to co-innovate?'*

### ***2.3.2 Identifying the underpinning theories and themes***

The goal of any research project is to contribute to the existing knowledge of the field (Merriam, 2014), in which case, understanding current thinking and reviewing empirical studies in the area is critical to attaining this goal. The review of the co-innovation literature for this project (chapter 1) shows that the phenomenon is reasonably well researched in high-tech industries yet only emerging in the agricultural sector. It is in this agricultural context there is an opportunity for this project to advance the current body of co-innovation research.

In addition to understanding how this project will fit with the existing knowledge base, the literature review is also a way of identifying underlying themes as another important foundation step of case study research (Rosenberg & Yates, 2007) (see figure 1 step 2). The theoretical framework (or conceptual framework as it is sometimes called) is the 'scaffolding' (Merriam, 2014) and 'map of investigation' (Miles & Huberman, 1984) for the study. Yin (1981) argues that many case study researchers fall into the trap of thinking that everything might be relevant so try to capture and analyse everything, however if the scope of the project is too broad the project becomes unmanageable.

The theoretical framework themes influence what to look for in the data collection phases (Van de Ven, 2007). It forms the starting point for the analytical categories through which the units of data were attached, examined, revised and developed. Starting with a framework provides a more defined pathway than purely inductively based analytical strategies that begin without such a framework (Saunders et al., 2003). Importantly, however, whilst the theoretical framework acts as a guide the design needs to remain sufficiently flexible that the themes can be modified and refined if evidence requires the researcher to do so as the study progresses (Yin, 1981).

Whilst reviewing the chain co-innovation literature, several themes emerged as key constructs for chain co-innovation. Consideration was then taken to choose themes which covered enough of the area of interest to build a holistic picture yet keep the framework to a manageable size.

The three major themes that were identified as important to the area of interest, however would allow the project to meet that objective were: (figure 2).

- 1) 'Engagement' as in the relational and knowledge related drivers that allow individual people to connect the businesses in the chain.
- 2) 'Communication' as a broad term to investigate the practices necessary for information exchange.
- 3) 'Architecture' as a broad term for the structures, processes and technology required for collaboration.

**Figure 2: The three major themes which comprise the theoretical framework for this study**



Once the three key areas of interest were identified from the literature review, I needed to find a structure or structures that would not only focus my exploration of these themes but would be able to be integrated to address the wider topic of co-innovation in agri-chains. The guiding models which were ultimately selected to explore each of these three major themes were:

- 1) Hansen and Nohria's (2004) framework which was created as an explanation of how to build collaborative advantage through eliminating barriers which impact on individuals' willingness and ability to collaborate with team members was used as a framework for collaborative engagement (1.7.3).
- 2) Mohr and Nevin's (1990) theoretical model on communication strategies in marketing channels was used as the framework for communication practices (1.8.3).
- 3) MacCormack et al's (2007) proposed 'Four Pillars of Collaborative Capabilities' was used as the framework for chain architecture (1.9.3).

From the thematic review of these frameworks, sixteen subsidiary research questions were proposed (sections 1.7, 1.8 and 1.9). Finally, in section 1.10, an interim model of how these themes might fit together in the agri-business context was shown. At the conclusion of the literature review in chapter 1, the foundation was set to evaluate these three themes within three global agricultural chains (chapters 3, 4 and 5) and then bring them together as a preliminary model for further evaluation (chapter 6).

### ***2.3.3 Determining the research context***

The third step of the Rosenberg and Yates (2007) model (figure 1) is determining the research context. The context for this study is global agricultural value chains. This is an interesting area from a research, practical and personal point of view. From a research perspective, studies in co-innovation in value chains phenomena have tended to be conducted in high-tech industries (Van de Vrande et al., 2009) however, since agri-chains have their own distinguishing features in terms of their production constraints, innovation, culture and industry structure, it is important that special studies are conducted within the sector (Meulenbergh & Jongen, 2005).

From a practical point of view, co-innovation strategies are relatively under-utilised in the agricultural sector (Fearne, 2009) yet the area is of great importance to the industry. As the population increases and agri-chains evolve, consumers are also getting further away from the farm gate and increasingly reliant on global agri-chains to feed them (Marshall, 2004). The changes and challenges in the global landscape mean innovation is now considered one of the most important strategic issues for agri-food chains (Grunert et al., 1997; Meulenbergh & Jongen, 2005; Roucan-Kane et al., 2013) and the only source of long-term competitive advantage in the agri-food industry (Fearne & Hughes, 2000). We must think about how we are going to manage our agri-food chains in order to feed the world with the products they desire when they desire them.

On a more personal note, as stated previously, my background is in the fresh produce industry. I hope this work contributes meaningful insight and thought for other industry professionals.

#### ***2.3.4 Determining the specific case studies***

A defining characteristic of case study research is that it occurs within a bounded system, that is to say, something that can be 'fenced in' whether that be a person, a group, a community or in this case, a global agri-chain (Merriam, 2014). When selecting cases for study, cases should be carefully chosen that are relevant to the context and will provide rich data (Yin, 2009). This often requires initial investigation on suitability prior to the commencement of the project (Patton, 1990).

This research required a multi-level approach. The bounded unit of analysis is a global agricultural value chain as the phenomena of interest is co-innovation at the chain level. However, in order to understand the chain, individual's experiences and opinions need to be collected to build a picture of the collective attitudes of the business. This feeds into understanding the collective business views to examine how they interact to form the chain behaviours and practices.

There are a number of experienced case study researchers who express a preference for including multiple cases to strengthen the robustness of the findings (Doz, 1996; Eisenhardt, 1989; Hennart, 2006; Salk, 2005; Yin, 2009). Similar cases make the argument more compelling or fill in gaps, whilst contrasting cases provide deeper insights to the original results and may also allow for broader generalisability of the conclusions (Yin, 2009). For this reason, three agri-chains were carefully selected, chain one being a co-innovating global agri-chain, chain two being selected as a similar case to make the argument more compelling and filling in the gaps, and chain three, an arms-length trading agri-chain, selected as a contrasting chain to provide deeper insights to the work.

To recruit the chains, a short list was created from desktop research and knowledge of the agricultural industry. The initial approach was to contact the Australian or New Zealand CEO or senior executive and involved a detailed discussion about the purpose of the study, the suitability of participants and the required commitment.



The selection criteria for the case chains were:

- 1) Chains which were currently exporting / importing an agricultural product across the Pacific Ocean;
- 2) Chains which had a long history of working with a global, in-market partner; and
- 3) Chains where both partners were willing to participate in the study.

If the Australasian senior chain member was happy to participate in the study they were asked to approach the North American partner. This process continued down the list until three appropriate chains were selected that were deemed to be able to provide in-depth insight to the research questions and both businesses in the chain agreed to participate.

Finding appropriate chains for this study had its challenges. Part of the challenge was there are not a large number of Australasian agricultural businesses which fit the criteria with suitable experience and strength of relationship to provide insight into co-innovation in global agri-chains. There were several chains which were investigated as possible participants but did not meet the criteria. Secondly, four businesses declined to participate due to difficulties of the season taking precedence of employee time; one declined because senior executives were concerned there could be risks of sharing information with a researcher and two businesses declined as they were decreasing business with their USA counterpart.

Prior to participating, discussions took place with the key contact about their suitability for the project. Of the three chains that were selected for participation, two of them were self-described as collaborative by the management of the individual businesses. Both of these chains handled proprietary, branded fruit varieties; had spent many years developing a joint business model where trust and commitment were paramount; had mechanisms for transparency (particularly in forecast planning and sales reporting) and frequently worked together on agreed projects. The third chain was self-described as being in a trading relationship and the two businesses in that chain conducted their business contingent on price, shared less information with each other and entered into fewer joint projects. Chain one was a theory building case which was compared to a similar case (chain two) and

contrasted with a differing case (chain three) in order to refine and extend the theory (table 1).

**Table 1: Summary of the selected case chains participating in this study**

<i>Chain</i>	<i>Chain Type</i>	<i>Product Type</i>	<i>Supplying Business Location</i>	<i>Buying Business Location</i>	<i>Sample purpose</i>
One	Collaborative	Branded, proprietary fruits	New Zealand	Canada	Theory building case
Two	Collaborative	Branded, proprietary fruits	USA	Australia	Similar case
Three	Trading	Agricultural food products	New Zealand	USA	Contrasting case

### **2.3.5 Identifying the data collection methods**

In the interpretive qualitative approach selected for this project the researcher sees people as the primary source of data (Mason, 2002), and requires a data collection method which is sensitive to unveiling the underlying meaning of the data (Merriam, 2014). Interviews are one of a qualitative researcher's tools and often take place when a researcher is exploring an area where practice and opinion have not yet been articulated in a systematic way (Bryman & Cassell, 2006). Qualitative interviews are typically semi-structured or open ended so that participants can provide the research with both facts, opinionated facts and opinions (Yin, 2009). A good interview will not just unveil knowledge and experience but also thoughts and feelings (Patton, 1990).

#### **2.3.5.1 Convergent interviewing**

The interview method used in this research was the convergent technique, which is about gathering and interpreting people's experiences, knowledge and opinions until they

converge on important issues through a number of interviews (Riege & Nair, 2004). The convergent interviewing technique has been identified as particularly useful in newly emerging areas of research (Rao & Perry, 2003; Riege & Nair, 2004; Williams & Lewis, 2005) due to its exploratory approach and ability to focus in on key issues where there is little established theory (Rao & Perry, 2003; Riege & Nair, 2004). Convergent interviewing is structured in its process and therefore able to narrow down large quantities of unstructured data in a timely manner, yet it is flexible in its ability to continuously refine the content and approach through the data collection, analysis and interpretation phases due to the cyclical nature of the process (Rao & Perry, 2003; Riege & Nair, 2004; Williams & Lewis, 2005).

In convergent interviewing, initial interviews are open-ended and loosely structured to allow for participants to talk openly and let themes, that haven't been pre-determined by the researcher, emerge (Jepsen & Rodwell, 2008; Riege & Nair, 2004; Williams & Lewis, 2005). When using this technique it is suggested to ask participants to talk about their 'story' or 'experience' as a good way to get participants talking without having to intellectualise the situation or rationalise their answer (Riege & Nair, 2004). I also found asking "can you please give me an example of ..." and "can you please tell me about..." good ways to get interviewees to describe situations or things that have happened in their own way or to get them to expand on an idea in more detail.

An advantage with this non-threatening style of questioning is that when the researcher probes for further explanation, the participants were more comfortable in justifying their answers (Riege & Nair, 2004). More structured probing questions were required to test the data and bring clarity to emerging themes as the interviews progressed and converging or diverging issues became apparent (Jepsen & Rodwell, 2008; Rao & Perry, 2003; Riege & Nair, 2004; Williams & Lewis, 2005). Practical examples to how probing works include, a probe for a convergent idea tries to find exceptions to the agreements (Jepsen & Rodwell, 2008). An example in this project was, "Has there ever been a time when your chain partner refused to share information with you?" Conversely, a probe for a divergent idea is seeking explanations for the disagreement (Jepsen & Rodwell, 2008), an example was, "One of the arguments against co-innovation is that you become too interdependent on your partner. What are your thoughts about that?" As the project progressed new themes emerged

which led to further probing questions to test those convergent and divergent ideas (Riege & Nair, 2004). Researchers generally warn against yes-no questions (Merriam, 2014) and these were avoided in the interviews.

Convergent interviewing technique in its early days was about identifying convergence and discarding disagreements (Dick, 1990) but in more recent years the diverging themes have been given the same consideration as the converging ones (Riege & Nair, 2004; Williams & Lewis, 2005). Williams and Lewis (2005) found in their experience the divergent views were providing interesting areas for further probing which often led to interesting findings. Riege and Nair's (2004) research concurs that divergent views can provide interesting outcomes although they cite a slightly different reason. They explain that at times a divergent idea that surfaces early and doesn't come up in the next few subsequent interviews can be written off as irrelevant too early. It then can emerge sometime later and prove to be an important issue. These explanations that emerge from contradiction are useful for developing holistic explanations because they are different views of the same phenomenon (Van de Ven, 2007).

The interview process stopped when stability was achieved and both convergent and divergent views were explained (Jepsen & Rodwell, 2008; Riege & Nair, 2004) as knowledge derives from where there is relative consensus or where there is explained disagreement (Guba & Lincoln, 1994). Rao and Perry (2003) argue that this method for recognising when the data collection phase has been completed is one of the key benefits of convergent interviewing and moreover, one of the factors that sets it apart from conventional interviewing techniques.

In addition to the interviews some documentation was collected, however, these documents were demonstrations of what was discussed in the interviews. For example, copies of the forecasting excel spread sheets used in chain one to coordinate supply and demand. These documents were used to provide credibility to interviewees accounts.

### ***2.3.5.2 Identifying the individual participants***

In order to explore the collaborative context for each chain, interviews were conducted with the individuals who participated directly in chain activities. Participants were purposively sampled, on the basis that they were either front line, day to day partners; senior executives that were influencers of the relationship or managers whose operations were directly involved in the partnership as these roles would provide the richest data (Doz, 1996).

When using the convergent technique in case study research, an important part of selecting participants is choosing the appropriate person to contact first. It should be someone who can direct the researcher to others that will be able to give worthwhile contributions to the study (Jepsen & Rodwell, 2008; Patton, 1999; Riege & Nair, 2004). It's for this reason that the most senior member of each of the participating companies was both the initial point of contact and the initial interviewee. It was this senior person who nominated employees who would be suitable participants for the interviews based on the roles which had the most contact and influence over the business partnership. In regards to sample size, whilst some researchers recommend specific ideal or minimum numbers of participants, other researchers believe that the sample size should be as big or as small as necessary in order to reach data saturation or 'data-drive' as opposed to a predetermined ideal of the number of interviewees (Riege & Nair, 2004). For this reason, each interviewee was also asked for suggestions of other people that might be able to contribute meaningfully to the research due to their experience in the chain (Jepsen & Rodwell, 2008). The total number of participants was reached only when the names of the people that had already been interviewed were being suggested (Doz, 1996). This provided an additional four participants for chain one, no extra participants for chain two and one additional interviewee in chain three.

This type of selection is a very strategic and deliberate type of sampling where the sample is about what will provide relevance as opposed to selecting a sample that is representative of all the people within the value chain (Mason, 2002). Gender, age, race or any other individual characteristics were not part of the basis for participants' selection.

The final number of people interviewed was 29 (n=29) over 31 interviews (two people had follow up interviews). Table 2 details the interviewees from each chain. The number of chain participants interviewed ranged in size. Chain one, n=15; chain two, n=3, and chain three, n = 11. Chain two was a smaller chain than the other two chains. Originally four people were to be interviewed in chain two (the CEO and the account manager from one business, and their respective counterparts, the VP and the account manager of the other). However, the account manager of the US business left the company before the interview stage, leaving the chain with only three participating interviewees. Whilst chain two has a smaller number of participants than the other two chains, in each case, the key participants from the chain, as appropriate to the size and structure of the chain, were interviewed. The majority of interviews (n = 27) were conducted face to face and two interviews were conducted over the phone (specified by \* in table 2). To protect the privacy of the participating businesses and individuals no identifying names, titles or labels will be used.

**Table 2: Description of the participants interviewed in the three agricultural value chains for comparing co-innovation**

<i>Chain</i>	<i>Supplying Business Participant Roles</i>	<i>Buying Business Participant Roles</i>
Collaborative chain one	CEO	Director
	GM International Sales*	Sales
	Marketing	Marketing
	Operations	Account Manager
	Planning	Co-ordinator one
	Varietal Development	Co-ordinator two
	Grower Manager one	
	Grower Manager two	
	QC and Packing	
Collaborative chain two	Senior VP*	CEO
		Account Manager
Trading chain	President	Director
	Senior VP	Logistics
	Account Manager	
	Supply Chain	
	Operations	
	Planning Manager	
	Product Planner one	
	Product Planner two	
	Technical Manager	

\* interview was conducted by phone

\* chain two comprised only three people however the chain participants confirmed that these were the three relevant people who connected the chain

### **2.3.5.3 Obtaining ethics approval for research**

Ethical clearance for interviewing of participants was obtained by the Human Research Ethical Committee (HREC) Tasmania Network. The committee evaluated the research

proposal which detailed the research design, participant selection, interview procedures, monitoring, data storage and potential benefits, risks and harms to participants. The proposal was approved prior to commencing data collection. Annual progress reports are submitted to the committee.

The design of this study is aligned with the National Statement on Ethical Conduct in Human Research published by the Australian Vice-Chancellor's Committee (AVCC) of the Australian Research Council in accordance with the National Health and Medical Research Act 1992 (Australian Vice-Chancellor's Committee, 2007). There are four key components to the AVCC guidelines. Namely, a research project must have 1) research merit and integrity, 2) justice, 3) beneficence and 4) respect.

- 1) Research merit and integrity is about how the research is designed and developed. The project should be based on thorough study, conducted or supervised by people with experience and conducted with integrity
- 2) Justice is about the fair recruiting of participants and ensuring that there is no exploitation of participants and fair access to the benefits of research. Prior to the interview all participants received written and verbal information in regards to what the study is about, why they have been invited to participate and what the interview involves. Their participation was entirely voluntary.
- 3) Beneficence in research is ensuring that the likely benefits justify any risks of harm or discomfort to participants. Participants may potentially benefit from being part of this study through learning more about co-innovation with their value chain partners. The senior members of the chain have also received the article submissions (chapters 3, 4 and 5) to disseminate to their business as they see fit.
- 4) Respect requires having regard for human value. Their rights, their beliefs, their culture, their privacy and confidentiality. Confidentiality is offered to participating companies and individuals to mitigate potential risks of their comments leading to loss of market share, weakening business relationships or personal loss of employment. Participants could decline to answer any question and were allowed to pull out of the study at any time. A further safeguard to privacy and confidentiality is



that everything they said or showed me will be kept confidential both in terms of themselves and the business they work for.

(Australian Vice-Chancellor's Committee, 2007)

Because this research was conducted in four different countries (Australia, New Zealand, The United States of America and Canada) ethical considerations from all four countries needed to be considered (Australian Vice-Chancellor's Committee, 2007). The application was submitted to an Australian ethics committee who oversees ethical conduct in human research at the University of Tasmania.

Additional ethics approval in New Zealand was not required because a review was not required under the scope of the Health and Disability Ethics Committee (HDEC), the research was not connected to any New Zealand research institution and the research was not funded by The Health Research Council (HRC) of New Zealand.

In the USA, researchers engaging in studies involving human subjects should refer to the regulations from the Office for Protection from Research Risks (OPRR) which is a unit within the Department of Human and Health Services (DHHS). Additional ethics approval was not required in the United States of America because the research was not conducted or supported by DHHS, the project did not receive funding from the US Federal Government and The University of Tasmania does not have a Federal Wide Assurance with the OPRR. Whilst the DHHS does not have jurisdiction over this research the OPRR guidelines are in keeping with those outlined in the Australian National Statement of Ethical Conduct in Human Research with the same ethical principles of respect for persons, beneficence and justice.

The Tri-Council Policy refers to the comprehensive, Canada-wide policy on research ethics developed by the three major research grants councils in Canada: the Medical Research Council (MRC), the Social Sciences and Humanities Research Council (SSHRC), and the Natural Sciences and Engineering Research Council (NSERC). All universities in Canada are required to establish institutional review boards to review, document and ensure that any research involving human subjects is conducted in accordance with the ethics standards

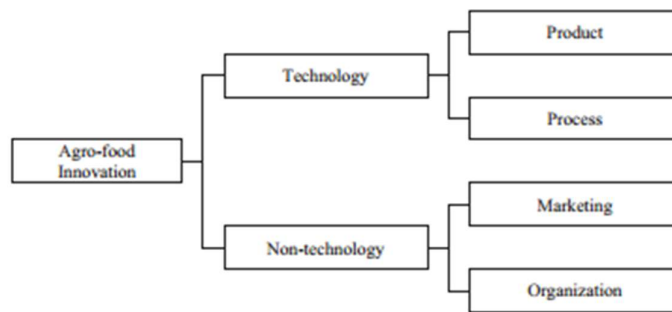
established by the Tri-Council. However, additional ethics approval was not required for this research in Canada because this research is not receiving funding from the MRC, the SSHRC or the NSERC, it is not being conducted at a Canadian research institution and it is not a Canadian Government activity.

#### ***2.3.5.4 Interview conduct***

The interviews were conducted between March 2013 and March 2014. The accumulated total of data was over 26 hours with each session ranging from approximately 30 minutes to 90 minutes. All interviews were audio-recorded for accuracy (Riege & Nair, 2004). The interview recordings were imported and transcribed verbatim into Computer assisted qualitative data analysis software (CAQDAS). The chosen CAQDAS was QSR International's NVivo software program. Transcripts were emailed to each participant for checking. The interview schedule was tested (n = 3) in order to practice interviewing and to work out which questions yielded the best information or needed rewording (Merriam, 2014). Whilst the pre-test data was not used in the final study it was useful to revise the interview schedule.

The interview questions included a general understanding of the chain and specifically their partnership, how willing and able they were to engage with other chain members, how they communicated, their joint business structures, HR practices, processes, technology and systems. Additionally, participants were also asked to describe successful and unsuccessful co-innovation projects. The project descriptions were categorised according to 'type' using Caiazza et al's (2014) categorisations (figure 3).

**Figure 3: Types of agricultural food sector innovations, reproduced from (Caiazza et al., 2014)**



**Source: (Caiazza et al., 2014)**

Innovation in agri-food chains can include technological innovations (products and processes) and non-technological innovations (marketing and organisational innovations) (Caiazza et al., 2014). Product innovations are new goods or significant improvements on features intended for the consumer. Process innovations are new or significantly improved processes for the production or distribution of a product. Marketing innovations are new or improved ways of promoting the product, including packaging, price, promotion or positioning and organisational innovations include business practices, organisational structures and external relationships (Caiazza et al., 2014). These projects were also used to determine how the areas of interest might influence co-innovation within the chain.

The interviewees collectively described 26 successful co-innovation projects which occurred within the case chains (table 3). There were additional examples of co-innovation projects that were given with other partners which whilst interesting, were not used in this project analysis.

**Table 3: Successful co-innovation projects within the three agricultural value chains as described during interviews**

<i>Type of innovation</i>	<i>Collaborative chain one</i>	<i>Collaborative chain two</i>	<i>Trading chain</i>	<i>Total</i>
Product	1	1	0	2
Process	3	2	1	6
Marketing	7	2	0	9
Organisational	6	2	1	9
Total	17	7	2	26

The interviewees collectively described 9 unsuccessful co-innovation projects which occurred within the case chains (table 4). There were additional examples of unsuccessful co-innovation projects that were given with other partners which whilst interesting, were not used in this project analysis.

**Table 4: Unsuccessful co-innovation projects within the three agricultural value chains as described in the interviews**

<i>Type of innovation</i>	<i>Collaborative chain one</i>	<i>Collaborative chain two</i>	<i>Trading chain</i>	<i>Total</i>
Product	0	0	0	0
Process	2	1	0	3
Marketing	3	0	0	3
Organisational	2	1	0	3
Total	7	2	0	9

The interviews were audio recorded which provides the obvious advantage of being able to accurately capture everything that was said. There are also additional advantages of audio recording, including achieving better rapport with the participant giving them their full attention with eye contact and showing interest (Riege & Nair, 2004). The interview recordings were imported and transcribed into NVivo. The only words that were excluded from the transcripts were my own encouraging comments such as 'yeah' 'mmm' and 'right'

as they were distracting at the analysis stage and not adding anything to the data. Participants 'um's', 'yeah's', 'you know's' and so on were included in the transcripts. The interviews were the only data source.

### ***2.3.6 Select analysis strategies***

Proceeding sections have detailed the problem formation (2.3.1), the identification of theories and themes (2.3.2), the study context (2.3.3), selection of cases (2.3.4) and the data collection strategy and conduct (2.3.5).

The next stage of research is to have a process of how to make sense out of the data (Merriam, 2014). Data analysis comprises four processes:

- 1) Categorisation which is about the creation of buckets derived from the theoretical framework to make sense of a massive amount of data
- 2) Unitising to reduce the volume of information by placing relevant data in the appropriate bucket
- 3) Recognising relationships, developing patterns to look for key themes within the data
- 4) Constructing hypothesis or frameworks to draw conclusions and communicate the essence of what the data revealed

(Patton, 1990; Saunders et al., 2003).

With each of these processes there is some cycling back through the steps (Merriam, 2014). Convergent interviewing in particular is cyclic in nature (Riege & Nair, 2004; Williams & Lewis, 2005). In the follow sections, refining the analysed data through the analytical filter, (categorization) (2.3.7), reducing the data into manageable chunks (unitization) (2.3.8) and recognising relationships and patterns to determine conclusions and theory development (2.3.9) will be discussed. N-Vivo was used to assist in these stages.

### ***2.3.7 Refining the analysed data through the analytical filter***

Categorisation is about the creation of labels (called 'nodes' in NVivo) which can be induced from the data or deduced from a theoretical framework (Saunders et al., 2003). These labels are the buckets ready for the researcher in which to place the data (Saunders et al.,

2003). In this study initial categories and thus, the first node system in NVivo were achieved by using the underpinning themes from the literature review (section 2.3.2). Initially all coded text was being placed into these original nodes, however over time the original nodes became parent nodes as different themes within the categories emerged. The node descriptions were continuously updated with rules for clarification as the thinking developed. When nodes had more than about 15 references in them they were reviewed and broken down into further categories required. Note that some nodes at the conclusion of the project were larger than 15 references but had been reviewed. Nodes with only one source were also reviewed for relevance and were combined with other nodes or deleted altogether. Several node children were moved to different categories as decisions were made on their best placement.

As described in section 2.3.5.1, in convergent interviewing typically analysis occurs simultaneously with the collection stage. Moreover, in qualitative studies the preferred method of analysis occurs concurrently with collecting data (Merriam, 2014). This is because at the outset of the study, the problem known but not what will be found (Merriam, 2014). By collecting and analysing data concurrently the researcher forced to make decisions about the direction of the project and narrow it down into a direction consistent with what the data reveals (Merriam, 2014).

### ***2.3.8 Reducing the data into manageable chunks and conceptual groups***

Unitising is the process in which the relevant data is placed in the appropriate bucket (Saunders et al., 2003). A coding-from-browser approach in NVivo was used to reduce the data into relevant pieces and group them together conceptually. The interview transcript would be opened and read through. As relevant text was identified it was coded to the relevant node. Due to the fact that this study was developmental in nature, auto coding using queries were not used. The coding occurred from the written transcripts as opposed to the audio recording because I found it easier to code from visual text and feel a more thorough outcome was achieved this way. During the coding process, thoughts, questions, issues, ideas and insights were recorded, mostly in the project journal (colour coded for ease of read through). Decisions and events were also recorded in the project journal to optimise reliability with an auditable trail.

Coding using NVivo offered several efficiency advantages to the process, including being able to code the same data to several nodes, being able to view the data in both the categories it has been coded to and within the original transcript, easy reviewing of categories, the ability for key word searching and the ability to make quick changes and modifications to nodes and node context as necessary.

### ***2.3.9 Determining conclusions and theory development***

Another important characteristic of qualitative work is that the process is inductive, in that, it uses collected data to build concepts and theory which can be a springboard for further examination and testing at a later date (Merriam, 2014).

Miles and Huberman (1984) advocate 'displays' as ways of assembling, viewing and drawing conclusions from the data. Displays include matrices, tables, checklists, charts and diagrams. These displays can then be used to better see patterns, compare and cross check data and as well as for reporting. Whilst Miles and Huberman (1984) are the pioneers of systematic ways of organizing data into interpretive displays, many other researchers use similar techniques for interpretation and reporting. In developing displays, Riege and Nair (2004) suggest listing the key issues that have emerged from convergent interview data in the most left hand column on a table and then by participant mark if they were in agreement or disagreement, or indeed, undecided or unsure about that issue. It's a good way to graphically see the relevance and convergence of the issues. This matrix would then be able to be worked into a summary table where, for example, the researcher could show what percentage of participants are in agreement, disagreement or undecided / unsure (Riege & Nair, 2004). My process was similar to Riege and Nair's (2004) approach. Tables and matrices were developed using excel. The left hand columns were first populated with the subsidiary questions developed in the literature review (chapter 1) so that each participant could be marked as in agreement, disagreement or unanswered for each point. These tables were then used to populate the scorecards included as tables (tables 3-4, 3-5, 4-4 and 5-3). Additional themes and ideas were added to the tables as further interesting concepts emerged.

In multiple case studies, first data is analysed within the case and then across the cases (Merriam, 2014). The excel matrices that were used to evaluate the chains individually were also combined and developed to draw cross-chain insights. For example columns could be highlighted when similarities could be seen between the collaborating chains that converged or diverged from the trading one. Excel tables and matrices made assembling and viewing these patterns clearer.

Recognising relationships and developing possible explanations for the relationships between the themes happened in several ways. The first step was to open up the relevant nodes and to review the data in that node to look for ideas as to how the themes connect. In many cases, child nodes were built to further subdivide or combine these thoughts. Once new themes had been identified the excel tables and matrices came back into play, adding rows and columns to check out the ideas by marking participant answers accordingly. Over time this process helped build up visual displays of those connections and explanations. It was from this process that the final model suggesting how the three project themes might fit together was developed to communicate the essence of what the data revealed (chapter 6 figure 1).

## **2.4 Research rigour: validity and reliability**

Regardless of the type of research, validity and reliability are a concern of any research project, yet how this is concern is addressed differs depending on the research paradigm (Merriam, 2014). In social science, when human participants are involved, it's also a matter of ethics that we construct valid and reliable research because people's lives are involved (Merriam, 1995). Therefore conducting credible research is critical not only so that the results are believed but it is part of being a responsible researcher. There are three criteria that are commonly used when evaluating the credibility of research: internal validity, external validity and reliability.

### **2.4.1 Optimising internal validity**

In qualitative research internal validity can also be viewed as trustworthiness (Guba & Lincoln, 1994) or credibility, and it is about how the findings match reality (Merriam, 2014).



Three strategies were used to optimise internal validity. 1) Triangulation of data sources; 2) researchers' position, and 3) peer review.

Triangulation in this study was achieved by source triangulation that is, getting more than one version of the story within business boundaries and the other side of the story from the chain partner to overcome subjective bias (Yin, 2009) as well as corroborating interviewees accounts with documentation. Analytical triangulation was also achieved by using the convergent interviewing technique so that identifying causal relationships is part of the process (Williams & Lewis, 2005).

One of the key issues in internal validity is how the researcher views reality (Merriam, 2014). The philosophical framework of this study was established in section 2.2 and it was stated that this project is built on an interpretive paradigm. That is, one where the researcher sees reality as collective, subjective, with multiple meanings and changing over time (Guba & Lincoln, 1994; Kelemen & Rumens, 2008). By the very nature of the philosophical framework, the researcher is applying their own interpretation on someone else's interpretation of the situation (Merriam, 1995) and thus could inadvertently influence data collection (for example asking leading questions in interviews) or put their own slant on the data analysis and interpretation (Onwuegbuzie & Leech, 2007). This concern was combated by gaining knowledge of the relevant theories prior to commencing the investigation (Riege & Nair, 2004). Prior knowledge is useful when designing questions, it helps to establish rapport in the interviews and gives the researcher a better ability to assess the importance of interview content so the researcher can be more selective about when to discard or probe disagreements (Riege & Nair, 2004). Furthermore, in addition to stating my philosophical position as a researcher (2.2) I also made my experience in the agricultural industry clear (2.3.1) which provides readers with a background to my interpretation of the findings (Merriam, 2014).

Finally, each stage of the project was reviewed by the research supervisory team (Merriam, 1995). Approximately every six weeks throughout this project I met (via video conference) with my supervisory team who were updated each step of the way and had the opportunity

to comment where they felt rigour was insufficient. Each of the individual papers (chapters 3, 4 and 5) were also peer reviewed.

#### ***2.4.2 Optimising reliability***

Reliability is traditionally about how replicable the research findings are (Merriam, 1995). That is to say, the extent to which other researchers can repeat the study and achieve similar outcomes (Riege, 2003). In qualitative research this can be problematic because humans are not a static unit of measurement (Riege, 2003). Reliability assumes the world has a constrained reality that can be repeatedly studied but interpretive research is based on the view that an individual's reality can be different from another person's reality and can change overtime (Merriam, 2014) and intuitively we understand that people's opinions and views may change over time (Merriam, 1995; Riege, 2003). Therefore, being able to exactly replicate a qualitative study is unrealistic, but that doesn't mean the results of qualitative work aren't valuable (Merriam, 2014). The point of interpretive work is to find meanings in human experience and differences that emerge from repeating the study may provide additional interesting findings about the project area (Riege, 2003). Therefore in qualitative work, the focus of reliability here should be the consideration of whether the findings are dependable or consistent with the data' (Merriam, 2014).

Strategies a qualitative researcher can use to ensure consistency with the data are triangulation, coding checks, peer review and an audit trail (Merriam 2014). Triangulation and peer review have already been discussed in internal validity (2.4.1) so here I wish to address coding checks and the audit trail for this study.

Throughout the coding process regular breaks were taken to check the content of the nodes was aligned to the category definition to optimise internal validity as using correct coding and unitising techniques to reach logical conclusions is important here (Woods & Hecker, 2011). This step was critical to the project as usually there were a number of changes in regards to the appropriate bucket for emerging concepts and ideas. The ease in which I could re-code a piece of text to an alternative node and delete it from the original node, or code all or part of the text to multiple nodes without losing the data integrity or its source was another advantage of using N-Vivo. I did all the coding so no multi-person checks were

required but I did review the coding after completing all of the interview coding to check for my own consistency.

A good audit trail provides transparency between the data collected and the results reported and thus a qualitative project should be able to demonstrate how the results were reached. The audit trail for this study has included, giving full accounts of theories and methods, keeping a note book of progress, ideas and supervisor feedback and assuring congruence between the research problem and design which was also reviewed by my supervisory team. In this chapter I have described in detail how cases and participants were selected (2.3.4), how data was collected (2.3.5), how categories were derived (2.3.2 and 2.3.7), and analysing that data to draw conclusions and develop theory (2.3.6 – 2.3.9)(Merriam, 2014). Rao and Perry (2003) and Williams and Lewis (2005) also argue that in convergent interviewing reliability will be achieved through the structured processes of interviewing, recording and analysis and interpreting the data. N-Vivo also contributed to this process date stamping data as it was imported, transcribed and coded. Part of this process was keeping an electronic journal as a running record in the N-Vivo system detailing interactions with the data from categorisation to analysis and interpretation reflections and decisions.

#### ***2.4.3 Optimising external validity***

External validity, generalisability (Patton, 1990; Saunders et al., 2003) or transferability (Guba & Lincoln, 1994) is about the extent to which the findings are transferable to other settings (Saunders et al., 2003). Case studies and convergent interviewing seldom use random sampling and are bounded by a small unit of measure. This is true in this study and the sample size and non-randomness is often criticised as an external validity issue since the findings from a specially selected sample cannot be extrapolated to the overall population (Merriam, 1995; Rao & Perry, 2003; Riege & Nair, 2004). One of the ways in which external validity was strengthened in this project was to use variation in the case studies (Merriam, 2014). Several case studies were chosen from differing agribusiness sectors and within those case studies varying roles were investigated which allows for a greater cross section of views (Yin, 2009). The evidence was also compared with extant literature (Riege, 2003).

Further to the discussion on external validity, the researcher doesn't need to say if something is generalizable because the reader, with their own experiences, can decide if the findings can be applied to their own context and situation (Merriam, 2014). In this case, it's important for the researcher to have been sufficiently thorough in reporting that the reader has the information they need to be able to make those decisions (Merriam, 2014). Therefore external validity is optimised by providing full descriptions and quotes in the findings and using 'rich thick descriptions' (Merriam, 2014). The goal of qualitative research is to deeply understand a specific situation rather than find something that is universally true because even a single case study can provide enormous insight (Merriam, 1995).

### ***2.5 Research design and methods chapter summary***

This chapter has detailed the research design and methods for this study. The study was based on an interpretative qualitative approach and the research design was based on Rosenberg and Yates' (2007) schematic for case study research (2.3). There are three underpinning theoretical frameworks used to guide this work (2.3.2). Hansen and Nohria's (2004) framework on how to build collaborative advantage through eliminating barriers which impact on individuals' willingness and ability to collaborate with team members was used as a framework for collaborative engagement. Mohr and Nevin's (1990) theoretical model on communication strategies in marketing channels was used as the framework for communication practices, and MacCormack et al's (2007) proposed 'Four Pillars of Collaborative Capabilities' was used as the framework for chain architecture.

Participants were purposively sampled from three global agri-chain case chains (2.3.4). Data were collected by semi-structured interviews using the convergent interviewing technique (2.3.5). Audio recordings uploaded and transcribed into N-Vivo where categorisation, (2.3.7) coding and unitisation (2.3.6) were performed. Excel matrices and tables were also used to draw conclusions and theory development (2.3.9). Research validity and reliability was addressed in 2.4.

Chapter 3 will now detail the findings from interviewing chain participants and chapter 4 will discuss these findings in light of the extant literature.

## **Chapter 3: Results**

### ***3.1 Introduction***

This chapter presents the collected, analysed, refined and reduced data from interviewing 29 employees of three chain member organisations about their co-innovation practices as outlined in the research methods described in sections 2.35 to 2.38 of chapter 2.

Whilst the findings from each of these three frameworks are not intended to answer the research question in isolation, the results will be presented in this chapter by working through each construct in turn. That is 1) Hansen and Nohria's (2004) four barriers to collaborative engagement; 2) Mohr and Nevin's (1990) theoretical communication strategies; and 3) MacCormack et al's (2007) four pillars of collaborative capabilities.

The discussion and integration of these three constructs is presented in chapter 4.

### ***3.2 Findings from applying Hansen and Nohria's (2004) framework to the context of global agri-chains***

This section details the participants' responses to interview questions and participant accounts of co-innovation projects as they relate to the propositions adapted from Hansen and Nohria's (2004) framework. This construct identified how to build collaborative advantage through eliminating barriers of unwillingness to seek input and learn from others and an unwillingness to help; and inability to seek and find expertise and inability to work together and transfer knowledge barrier to determine how those barriers might influence the chains' co-innovation capabilities. The findings are summarised below in tables 1 and 2.

**Table 1: Status of the Four barriers to collaboration (Hansen and Nohria, 2004) based on NVivo analysis of the interviewees' responses**

<i>Barriers, adapted from Hansen and Nohria's (2004)</i>	<i>Collab- orative</i>	<i>trading</i>	<i>leadership</i>	<i>non- leadership</i>
<b>1. Unwillingness to seek input and learn from others</b>				
1.1. When they need help, employees are not willing to seek input from outside their organisation	willing	willing	willing	willing
1.2. When faced with problems, employees strive to solve them by themselves without asking for help	mostly willing	unwilling	willing	possibly unwilling
1.3. There is a prevailing attitude that people ought to fix their own problems and not rely on help from outside the business	willing	unwilling	willing	willing
<b>2. Inability to seek and find expertise</b>				
2.1 Chain members often complain about the difficulty they have locating colleagues who possess the information and expertise they need	able	able	able	possibly unable
2.2 Chain experts are very difficult to locate	mostly able	mostly able	able	possibly unable
2.3 Chain members have difficulty finding the documents and information they need in the company's databases and knowledge management systems	mostly able	mostly able	mostly able	possibly unable
<b>3. Unwillingness to help</b>				
3.1 Chain members keep their expertise and information to themselves and do not want to share it across business boundaries	mostly willing	mostly unwilling	willing	mostly willing
3.2 Chain members do not share their	willing	willing	willing	willing

expertise and information for fear of becoming less valuable

3.3 Chain members seldom return phone calls and emails when asked for help	willing	willing	willing	willing
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**4. Inability to work together and transfer knowledge**

4.1 Chain members have not learned to work together effectively to transfer tacit knowledge	mostly able	possibly unable	able	possibly unable
4.2 Chain members are not used to working together and find it hard to do so	able	able	able	Able
4.3 Chain members find it difficult to transfer complex technologies and best practices	able	possibly unable	able	possibly unable

**Table 2: Number of successful co-innovation projects where Hansen and Nohria's (2004) barriers were overcome**

<i>Barriers</i>	<i>Number of successful projects where the barrier was overcome</i>
Unwillingness to seek input and learn from others	38%
Inability to seek and find expertise	46%
Unwillingness to help	77%
Inability to work together and transfer knowledge	46%

**3.2.1 Unwillingness to seek input and learn from others**

Hansen and Nohria's (2004) statements to identify the presence of the barrier, were adapted for this context as follows:

4. *When they need help, chain members are not willing to seek input from outside their organisation*
5. *When faced with problems, chain members strive to solve them by themselves without asking for help*

6. *There is a prevailing attitude that people ought to fix their own problems and not rely on help from outside the business*

Leading to a proposition that:

*Proposition 1: Willingness to seek input and learn from other influences the chains' abilities to successfully co-innovate.*

To explore whether an unwillingness to seek input and learn from others constrained co-innovation between value chain members interviewees were asked to describe situations where chain partners asked for input or feedback on a problem or idea. They were also asked if there were any examples where, with hindsight, asking for input would have led to a different outcome. Interviewees reported that when chain members needed help they were willing to seek assistance from other members in the chain in all instances (n=27). However, there was a difference between the collaborating chains and the trading relationship in how comfortable the chain members were seeking help. In the two collaborating chains, businesses participants were in total agreement (n = 18) that they *"would not hesitate,"* and are *"very comfortable"* to ask their counterparts for anything. This was apparent even in relationships that weren't in frequent contact. By contrast, in the trading chain, six out of 11 participants said they would much rather fix their own problems without outside help and would strive to do so first. Interviewees from the buyer side of the trading chain expressed a particularly strong preference to solve problems independently. *We try and manage everything internally and at the last resort go back to [the supplier] because we don't want to be known as that pain in the arse... trading company"* said one. *"We try to be the non-issue customer"* agreed another.

The participants' accounts of the 26 successful co-innovation projects were used as an indicator of how a willingness to seek input or help from a chain partner might have influenced co-innovation within the chain. Participants reported seeking input or feedback on a problem or idea in 10 of the 26 projects, for example routinely requesting feedback on varietal developments *"[with] those companies [that] are intimate with us... we share what's going on and we show them the pipeline and they're giving feedback along the way. And that's powerful right."* In examining what happened when chain members requested partner input for projects it appears that the request opened up a channel for improved



information exchange leading to outcomes that were greater than the original project area. For example, when input was requested into a 10 year Plant Breeders Rights (PBR) business plan the participants left the workshop with *“wider opportunities outside just the scope of the PBR business”* such as plans for a new domestic joint venture to market other products. Another example was when there was a problem with the fruit size and it was suggested that the retailer would have to either take fruit that was outside their specifications or not any product. By asking for input and initiating further discussion out of this problem a new pack style was launched, *“[He] was like, well can they take this size? and I said, no, it doesn't meet this size profile. [Then he asked] well, can they switch to this size profile?... it was just communicating [then] suddenly we were putting [fruit] in a clamshell.”* A further two examples include requesting input into processes which crossed business lines with successive group discussions resulting in an online shipping portal in one case and a streamlined, efficient process which became the global template across several other chains in another case.

### **3.2.2 Inability to seek and find expertise**

Hansen and Nohria's (2004) statements to identify the presence of the barrier were adapted for this context as follows:

4. *Chain members often complain about the difficulty they have locating colleagues who possess the information expertise they need*
5. *Chain experts are very difficult to locate*
6. *Chain members have difficulty finding the documents and information they need in the company's databases and knowledge management systems*

Leading to a proposition that:

*Proposition 2: An ability to seek and find expertise influences the chains' abilities to successfully co-innovate.*

To determine whether an inability to seek and find expertise influenced co-innovation between value chain members, interviewees were asked about difficulties contacting experts in the chain or those who had the authority to act. Interviewees were also asked if they knew the background and expertise of their chain partners and about systems used to

capture chain knowledge and make it more accessible. Only a quarter (n=7) of participants reported having difficulty locating external chain experts and information and difficulties were for the most part reported to be due to time zone issues "*it's tyranny of distance*", as one interviewee put it, rather than the total inability to locate expertise. Whilst there were few complaints about being unable to access information and expertise, this may have been because some chain members didn't know what expertise was available within the chain. Approximately two-thirds of participants thought that they knew the background and skills of their immediate contacts (n = 18) but only eight participants could offer any meaningful information about their counterpart and only two participants knew anything about people they didn't connect with on a regular basis.

A systematic way of capturing and sharing chain knowledge was absent in all three chains (two of the six businesses did demonstrate internal knowledge management systems). Chain ideas and experience were stored and managed by individuals' emails and notes. Of the participants that discussed knowledge management (n=11) however, only four people thought that there may be a need for a more formal process for capturing and disseminating joint knowledge.

Despite multiple contact points in all three chains, 20 of the 29 participants (across all three chains) believed that their chain relied on a single (or narrow) point of contact for the majority of information flow and decisions. Some participants (n = 5) were positive about having a single point of contact, seeing it as a way to prevent mixed messages from being transmitted and enabling the key person responsible to maintain control. However, over twice that number (n = 12) were frustrated with slower information flow. Furthermore, four people thought that if the key person did not pick up on the idea then it would not progress further and one of the key people themselves admitted that an idea would only proceed if they "*personally drove it*".

When looking at this barrier within the successful co-innovation projects almost half (n=12) the successful projects required the project team to be able to seek and find specific expertise from the other business. Moreover, all of the 12 projects which required access to specific expertise were initiated and developed at the senior level. As an example, a deal

was struck between senior executives where the buying business brokered an agreement with one of their customers. It would have been impossible for this project to have occurred between these two people who are in support roles in this project. *"I personally don't talk about customers...the only person who could talk about customers or say customers' names to them would be [him]."* and *"I don't really have a good feel for who they're working with."* This finding suggests that this barrier is moderated by the hierarchical level of decision makers involved in the co-innovation.

### **3.2.3 Unwillingness to help**

Hansen and Nohria's (2004) statements to identify the presence of the barrier were adapted for this context as follows:

4. *Chain members keep their expertise and information to themselves and do not want to share it across boundaries*
5. *Chain members do not share their expertise and information for fear of becoming less valuable, and*
6. *Chain members seldom return phone calls and emails when asked for help*

Leading to the proposition that:

*Proposition 3: Willingness to help influences the chains' abilities to successfully co-innovate.*

To determine whether an unwillingness to help each other might influence co-innovation between chain members interviewees were asked participants were asked about information transparency within the chain and about the extent to which information and expertise was withheld from their chain partner. The collaborative chains were found to be more transparent than the trading one. Fourteen of 18 people in the collaborative chains thought there was a high level of transparency that within their partnership. The leaders of the collaborative chains were particularly vocal about this. *"That's probably one of the key things about this program is that it's very transparent."* said a leader in collaborative chain one *"there is nothing I'd hold back from him"* agreed his counterpart. This culture of openness was echoed by other chain members, *"We probably communicate more like we are colleagues in the same office,"* and *"the information is free flowing."* There weren't any

participants in the collaborative chains that thought they weren't transparent with their chain partner. However, although all the collaborative participants reported a high level of transparency in their relationship, four of 18 collaborative chain participants reported that they were at times uncomfortable with sharing information with their chain partner. The two main reasons for wanting to withhold information was the belief that the information could be used against them and a fear of saying the wrong thing. Not one participant said they were afraid to share information for fear of becoming less valuable.

The trading chain participants' view of transparency within their partnership was quite different. The information shared was mostly of a transactional nature. Only one interviewee of eleven described the chain as transparent and only two others felt that the chain was somewhat transparent. Of the remaining eight interviewees in the trading chain, three thought the chain wasn't transparent and five participants couldn't say. Three of 11 participants reported situations where they felt information needed to be withheld for fear of saying the wrong thing or for legal reasons. But as another interviewee explained, the level of transparency between chain members was largely influenced by the transactional nature of their relationship: *"So we've been relatively transparent I won't say fully transparent in the costs and the reason for that is that people start to haggle on the detail if we're too transparent."*

Participants in all three chains were mostly positive about chain members responding to emails and phone calls. Only four interviewees said responses from their counterpart were sometimes slower than desired on occasion but they didn't believe it was from a lack of willingness to help. Not a single person (n = 0) said their counterpart was poor at responding to emails and phone calls.

To explore how co-innovation by chain members might have been hampered by an unwillingness to help each other the successful project accounts were examined to determine what kind of information was shared amongst the project team. Twenty out of the 26 successful projects required information sharing that was outside of typical transactional transfer, indicating that partners had been willing to help each other by sharing information. Some projects required sharing information that would typically be

considered commercially sensitive, as indicated by interviewee comments that *“We've been able to use [our partner's] in house IT system... so we can dial in and see what's sitting at what shed”* and *“We have complete access to the customers”*. In other projects the information was publically available but a chain member went out of their way to make it accessible to the partner *“last week for instance, he brought a big bag full of packaging from the UK back.”* Looking at the nine unsuccessful projects, there were no projects that failed due to information being withheld or counterparts not returning emails or phone calls.

#### **3.2.4 Inability to work together and transfer knowledge**

Hansen and Nohria's (2004) statements to identify the presence of the barrier, were adapted for this context as follows:

4. *Chain members have not learned to work together effectively to transfer tacit knowledge*
5. *Chain members are not used to working together and find it hard to do so*
6. *Chain members find it difficult to transfer complex technologies and best practices*

Leading to a proposition that:

*Proposition 4: An ability to work together and transfer knowledge influences the chains' abilities to successfully co-innovate.*

To determine whether co-innovation between chain members might have been hampered by an inability to work together and transfer knowledge between chain members, interviewees were asked about the content of their communications with their chain partner. All participants in all chains gave examples of sharing transactional and operational information, such as, *“I also send them quite a detailed ship report each week.”* and *“information about the crop... what volumes are we expecting what fruit size are we looking at.”* and *“I'll do the contract, then work with [my counterpart] on a purchase order and a delivery schedule.”* When it came to tacit knowledge, however, the collaborative chains, shared much more of this hard-to-describe information than the trading chain. Over half of the collaborative participants (n=10) gave examples of sharing information that is difficult to impart via email or a phone call, such as when counterparts arranged a face to face meeting at the pack shed to discuss the specification variations for hail damaged fruit. As one

interviewee explained, sharing such information was crucial to building a shared understanding of how chain members could work together to leverage new opportunities because *“You can have that conversation over the phone, but until you actually see the fruit in a bin, on the line, in a box, you don't get a feel for how we are going to manage this.”* In contrast, only three out of 11 trading chain participants gave examples of sharing tacit information.

To determine how the types of knowledge used by chain members might have influenced their capacity to co-innovate, the accounts of the 26 successful co-innovation projects were examined. Tacit knowledge was found to be shared in 12 of the successful co-innovation projects. In considering the influence of tacit knowledge on co-innovation the unsuccessful projects were also considered. The study found that three of these nine projects were unsuccessful because due to a lack of critical information. However, in all three cases the information was missed not because it was withheld by one partner or the other, but because it was tacit information that neither partner identified as a knowledge gap. As one interviewee explained, they ‘didn’t know what they didn’t know.’ *“We knew nothing about [the product]. We hadn't sold a single box when we entered this arrangement... I had no idea and there were some wrong decisions made and [things] I would have done different, in hindsight I would have asked.”*

Chain members were found to have little difficulty understanding each other despite the chains’ gatekeepers being from different backgrounds and cultures. Just over a third of participants across all chains (n = 11) conceded that there were some small differences in terminology between the US and Australasia, such as sizes and measurements, and 12 people acknowledged cultural differences however not one person thought those differences were a barrier.

### ***3.2.5 Conclusion to findings from applying Hansen and Nohria’s (2004) framework to the context of global agri-chains***

The above section detailed the participants’ responses to interview questions and participant accounts of co-innovation projects as they relate to the propositions adapted from Hansen and Nohria’s (2004) framework. It was found that willingness was not a barrier

in the collaborative chains but possibly a barrier in the trading chain. Participants from leadership groups had a greater ability to access and use partner information to co-innovate than non-leadership participants. The key difference between the collaborative chains and the trading chain was the collaborative chain reported more willingness both in seeking input and in information transparency than the trading chain. The collaborative chains also demonstrated greater ability to transfer tacit knowledge than the trading chain.

In all three chains the leaders had greater ability to access information and expertise than the non-leadership roles and thus also used this information to initiate and lead more projects than the non-leadership group. Of the projects which required a deep understanding of the partner business, all of them occurred between senior executives.

Chapter 4 presents a discussion on how these findings compare with that of Hansen and Nohria's (2004) use of the framework; what these findings might mean for co-innovation in global agri-chain's and a suggested model for how chain member engagement in global agri-chains might influence co-innovation. Section 4.5 integrates the results from this engagement model are then integrated with the other two constructs (communication and architecture). as the application of this framework on employee engagement is intended to be part of a bigger picture of understanding how collaborative practices influence a global agri-chains' ability to co-innovate.

### ***3.3.1 Findings from applying Mohr and Nevin's (1990) framework to the context of global agri-chains***

This section details the participants' responses to interview questions and participant accounts of co-innovation projects as they relate to the propositions adapted from Mohr and Nevin's (1990) theoretical communication strategies framework of frequency, direction, modality and content. The findings are summarised below in table 3.

**Table 3: Summary of findings of the four facets of communication (Mohr and Nevin, 1990) as determined by Nvivo analysis of the interviewees reponses**

<i>Facets</i>	<i>Elements of the facets</i>	<i>Chain one: collaborative</i>	<i>Chain two: collaborative</i>	<i>Chain three: trading</i>	<i>Number of successful co-innovation projects where element is present</i>
<b>Frequency</b>	Frequency of communication	frequent	frequent	somewhat frequent	4
	Satisfaction with communication	satisfied	satisfied	satisfied	6
<b>Direction</b>	Bidirectional	bidirectional	bidirectional	bidirectional	18
	Transparent	transparent	transparent	somewhat transparent	15
<b>Modality</b>	Richness of modes	very rich	rich	somewhat rich	face to face: 14 phone: 6 con call: 3 email: 3
	Formality	both formal and informal	mostly informal	mostly formal	informal: 17 formal: 9
<b>Content</b>	Non-coercive strategies of influence	indirect	indirect	indirect	indirect: 22 direct: 4
	Explicit versus tacit content	explicit and tacit	explicit and tacit	more explicit than tacit	explicit: 14 tacit: 12



### **3.3.2 Frequency**

Mohr and Nevins' (1990) first communication strategy is frequency. A review of the extant literature on communication frequency led to the following propositions.

Proposition 5: Communication frequency influences the chains' abilities to successfully co-innovate.

Proposition 6: Satisfaction of communication frequency influences the chains' abilities to successfully co-innovate.

In the semi-structured interviews participants were asked how frequently they communicate with their chain partner. In all three chains, participants reported that the frequency of communication varied dramatically between 'in season' and 'out of season'. A typical comment was, for example, *"During the season, pretty close to daily. Out of season, pretty much not at all."* The following findings report only 'in season' communication frequency as described by the participants in the interviews.

Participants from the collaborative chains communicated slightly more frequently than the trading chain. In chain one, 14 of 15 participants said they communicated with their partners frequently. For six participants, 'frequent' was at least once a day with a further four participants saying they communicated with their partner at least once or more a week. The remaining four participants communicated with their partner less often than once a week. In collaborative chain two, two out of three participants said they were in frequent, daily communication in season, with the remaining participant less often than once a week. In the trading relationship eight of 11 participants reported frequent communication, however 'frequent' communication was less frequent in practice than in the collaborative chains. In the trading chain, only one participant communicated daily with their chain partner, four participants said they were in contact with their partner one to three times a week, and the remaining three participants, less than once a week.

As an indicator of the use of frequency in co-innovation we used the participants' accounts of the 26 successful co-innovation projects as described in the interviews. Whilst no one

used the words 'frequent communication' in any of the project stories, four projects were reportedly completed in a short time frame with a lot of back and forth between the partners which implies the partners were communicating frequently. An example of this was when there was an export opportunity for organic product but the customer wanted larger sized product in a season where the fruit was small: *"We had tossed around a bag programme [before] and so he sparked... from our conversations back and forth, it would be so much easier to do these in a bagged deal on the export market."* In a short period of time the project team turned a potential new export business seeking large, loose, organic fruit (a product they didn't even have enough of for their regular orders) into new business selling small, bagged organic fruit that they were having difficulty placing elsewhere.

Another indicator of how communication frequency influences the chain co-innovation is to look at the participants' reasons for the why the unsuccessful projects within the chain didn't work. Only one of the participants commented that they thought the frequency of communication was a problem in one of the project failures, *"we just didn't quite align our strategies and talk often enough on it"*

The evidence used to determine the satisfaction of communication between the chain partners was the participant's answers to interview questions about how happy (or not) they were with the communication between chain partners. Twenty-seven of 29 participants said they were satisfied (or more than satisfied) with the communication between partners in the chain. Two participants, one who was from collaborative chain one, and the other who was from the trading chain said they were neither satisfied nor dissatisfied.

When looking at what the participants said about the successful chain co-innovation projects to explore a possible link between satisfaction of communication and co-innovation, the participant's accounts of the projects were examined for signs of satisfaction with the communication practices used in the project initiation and development. For example, comments such as, *"There is a tremendous amount of dialogue... and that's powerful right,"* illustrate participant satisfaction in regard to the communication used in that project. Examples indicating communication satisfaction were found in six of 26 successful co-

innovation projects stories.

When looking at the unsuccessful co-innovation projects and the reasons given for their failure there weren't any that were said to have failed due to dissatisfaction with communication according to the interviewee's reports. When information exchange didn't occur the participants said that it was a short coming in thought rather than in communication, *"I had no idea and there were some wrong decisions made about that....in hindsight I would have asked."*

### **3.3.3 Direction**

Mohr and Nevins' (1990) second communication strategy is direction. A review of the extant literature on communication direction led to the following propositions.

Proposition 7: Communication directionality influences the chains' abilities to successfully co-innovate.

Proposition 8: Communication transparency influences the chains' abilities to successfully co-innovate.

Participants were asked how much each partner participated in the discussions and input of ideas. The participant answers were used to determine if the chains were largely bidirectional in their communication or not. In each of the collaborative chains, all but one participant believed the business to business information flow was good both ways, whilst one participant in each chain was neutral. Interestingly, every interviewee in the collaborative chains felt they were able to answer the question because even the participants who weren't in direct sales or leadership roles still received chain information such as weekly reports by email and participating in joint conference calls and group meetings. In the trading chain, all participants in direct gatekeeper roles believed the business to business information flow was good both ways, however, five people who weren't in a direct gatekeeper role said they couldn't answer the question.

In considering if bi-directionality is significant to co-innovation in the chains data was

examined to see if participants made mention of an ongoing two way flow of information and ideas in their accounts of the successful co-innovation projects in the chain. For example, in this following comment we see bidirectional sharing of ideas to form a new process for the chain that will benefit both parties, *"It was a collaborative effort. From all of us, just saying, you know, this is what we need and this is what we need, how can we best make it work out."* Another example is in an account of a new packaging project where bidirectional flow to coordinate the project development was reported, *"We go backwards and forwards with each other with phone calls and emails and we get everything sorted out"*. Not only were diverse ideas, opinions and information coming together in a large number of the projects (n= 18 of 26) but the participants also acknowledged these meetings of ideas and information were valued components of the chain projects. *"We share what's going on and we show them the pipeline and they're giving feedback along the way...It's feedback from a retailer perspective, it's feedback just from their massive knowledge of the world."* These accounts of bidirectional flows as part of the project differ from the hand-off style projects where one of the businesses initiates an idea and passes it on to the chain partner for the development and execution with relatively little two way interaction.

When using the participant reports of the unsuccessful projects as an indicator of bidirectional influence on co-innovation, it is found that 6 of 9 unsuccessful projects were reported to have failed due to either lack of co-ordination between the partners (n=2) or missing knowledge from the partner (n=4). For example, not understanding enough about the root stocks when they were first planting (information their partner knew), *"Seriously I had no idea about the difference that a root stock can make to a vine, in different soil types, different climate types, I had no idea,"* or a supplier misunderstanding the market dynamics *"So that probably was the big failure, lack of probably market understanding,"* again, this was information that their in-market partner had known but was not transferred.

To determine transparency participants were asked to talk about how transparent they thought the communication between the partners were. The collaborative chains were found to be more transparent than the trading one. Fourteen out of 18 people in the collaborative chains thought that within their dyad there was a high level of transparency. The leaders of the collaborative chains were particularly vocal about the transparency of

information sharing. *"That's probably one of the key things about this programme is that it's very transparent."* said the leader of the supply side in collaborative chain one, and *"there is nothing I'd hold back from him"* said his counterpart. This culture of openness was echoed by other chain members, *"we probably communicate more like we are colleagues in the same office,"* and *"I don't hesitate to email him and ask him stuff"* and *"the information is free flowing."* There were no participants in the collaborative chains that thought they weren't transparent with the partner business.

The trading chain participants' view of transparency within their partnership however, was quite different. Only one interviewee of eleven was positive about the transparency of the dyad, two others felt that the chain was somewhat transparent. *"So we've been relatively transparent I won't say fully transparent in the costs and the reason for that is that people start to haggle on the detail if we're too transparent"* Of the remaining eight interviewees in the trading chain, three thought the chain wasn't transparent and the remaining five participants weren't frequently communicating with someone in the partner business and didn't answer.

In considering if transparency was a key part of the successful co-innovation projects, the data was examined for information shared for each project. The information was considered 'neutral' in terms of transparency if the information shared was that which might be typical of a normal transaction, such as volumes, sizes, prices, pack styles required or information that is already in the public domain *"last week for instance, he brought a big bag full of packaging from the UK back."* There were eight projects where the participant accounts of the projects reported this kind of information sharing.

Within the other 18 projects, however, there was evidence of a partner allowing access to information that is usually considered to be commercially sensitive such as, *"We've been able to use [our partner's] in house IT system... so we can dial in and see what's sitting at what shed"* and *"We have complete access to the customers"* or sharing information that typically wouldn't be shared in a transaction in order to find the best allocation of resources for the chain as a whole, *"We did the numbers, worked out the freight, what we were going to lose on freight but what they were going to gain on the sales and also not repacking it out*

*of a normal box into an RST [retail standard tray] there.”*

When looking at the 9 unsuccessful projects, the 4 projects that interviewees said were missing critical pieces of information which were key to the project success, said that it wasn't because information was withheld, it was because the neither chain partner thought to ask or give that particular piece of information because they didn't know it was needed

As an addition to the participants accounts of communication transparency in the projects, one of the participants who has worked in new product development for 10 years with numerous customers made this comment about his experience of the effects of transparency on collaborative projects: *“There's definitely less iterations with the people that [are] more open...there's definitely a better rate of success or completion of the project...The close door type of thing, I mean, it doesn't help them too much. It's just wasting their resources and that's something that is always hard to quantify, how much resource drain is actually going into these projects that are not advancing because either these people do not have the skill or they're doing something wrong but they're not communicating “*

### **3.3.4 Modality**

Mohr and Nevins' (1990) third communication strategy is modality. A review of the extant literature on communication modality led to the following propositions.

Proposition 9: Communication modes influence the chains' abilities to successfully co-innovate.

Proposition 10: The formality of communication influences the chains' abilities to successfully co-innovate.

In the semi-structured interviews the participants were asked to tell us how they communicated with their partner such as phone, email, text message or other ways. Whilst participants from all three chains reported using a mix of modes for transmitting information, the collaborative chain participants reported using richer modes more

frequently than in the trading chain. In collaborative chain one, 10 of the 15 participants met face to face approximately three times each year. All three participants in chain two met face to face at a similar frequency. In the trading chain, by contrast, only two participants reported regularly face to face meetings with their counterpart. The participants in the study that did meet face-to-face with their partners were positive about the mode, in terms of building rapport: *"You meet them personally and it does make a difference and you do learn a bit more about them and yeah, I do think that that does help the relationship"* said one participant, and *"Once I've seen her, she's seen me and we were kind of, you know, you feel closer, like you know the person."* Participants were also positive about using face to face meetings for transferring information that was hard to do by other modes: *"I think there is a lot of merit being face to face and I think you've got to, you know, if there is an issue you can visualise it and see first-hand what you are both referring to and I think you can just break something down and get more detail out of it. You know I think it's more effective to meet face to face."* As well as more effective brainstorming, *"When [we get together] ...we'll talk about bigger ideas... When we're together we're talking about how do we get things done."*

Realistically, however, for day to day communication, face-to-face communication isn't possible with chain partners in opposite hemispheres. Therefore, other modes must be used. Participants across all three chains, for day-to-day communication had a slight preference for email (n=11) for a number of reasons. It was chosen for its accuracy (n = 4): *"it's easier to say, okay, here's your PO, here's the quantity, here's your delivery date. I think if I went through a lot of that on the phone it could be, and she has to write, it would be cumbersome."* The convenience of email due to time zone differences (n=3): *"A lot of it is email, right. It's just because of the time zone difference."* And also, personal preference (n=2): *"in terms of the split between the two, I think that probably comes down to a personal preference so for some customers would deal more on email."*

Whilst email overall was the mode participants chose most often, the phone was a close second. *"We email numerous times a day and we speak a couple of times a week"* and *"we probably talk 2 or 3 times a week and emails are going backwards and forwards every day"*.

Nine participants said they used both email and phone the same amount, and only four participants said they prefer to use the phone more than email.

Collaborative chain one stood out with their use of conference calls. Six of 15 chain one participants talked about the frequent use of conference calls (or 'con calls' as they all called them) to sort out issues when a number of people from different sites were involved. Two participants from chain one also talked about using internet portals for sharing information and both believed that there would be more use of the internet as a communication mode in the chain in the future.

In evaluating modes and their influence on the co-innovation projects the participant accounts the successful projects were analysed. In most projects there were a number of modes used to bring the idea from inception to commercialisation so in evaluating the modes we determined the mode that was used when initiating the idea. Fourteen of the 26 projects were initiated face to face and there was also an acknowledgement from several participants that the opportunities to meet face to face were positive for co-innovation. *"We've had some really good planning meetings, down there with the guys... all of us talking about potential for where the markets are at. What we see. What we want."* Six projects initiated by phone, *"something like that could be misinterpreted by email so you definitely want to have the phone conversation first."* Three projects began on a con call and three were started via email *"It started with email and just getting the right people into the conversation"*

Looking at the unsuccessful projects, no participants made mention that they felt things could have gone better within the project if a different mode was used. In three of the nine projects, face to face meetings were part of the project and still, that did not ensure that the right information was exchanged.

To explore the use of formal and informal communication in the chains, the participants were asked to talk about how formal or informal the communication was in the chain. In all three chains there was a mix of formal and informal communication. In chain one, both formal and informal communications were equally apparent. All 15 chain one participants



gave detailed descriptions about the regular, formal joint reporting commitments, in particular, all 15 interviewees referred to the weekly joint sales reporting, six of 15, mostly those within the operational / logistics side of the business referred to the regular Excel shipping reports and leaders from each business talked about board papers that they contributed to each other's board reports. However, all 15 participants also gave examples of informal communication where one off information was sent through or chatting on the phone or at events with no particular agenda.

Chain two, was slightly more informal and irregular in their chain communication. Whilst all participants referred to regular meetings with a formal agenda overall they described their communication style as more informal and irregular. "[our communication is] *highly irregular*" said the leader of one business in chain two, "*it's always a little spontaneous with him*" agreed his counterpart.

The trading chain was more formal and structured in their approach to communication, particularly from the supplier side of the partnership. "*It is structured, it's not just a random call*" said the Account Manager and "*It is formula.*" was how an operations team member described the chain's communication. Seven of the 11 participants from the trading chain, described formal communication with most of them going into detail about how each customer has a level of contact that was expected each quarter and how each communication was expected to have purpose. Only three participants from the trading chain gave examples of informal communication.

When looking at formal and informal communication in the successful co-innovation projects, again the focus was on the communication style that was said to be used at the project's initiation. Seventeen projects were started from an informal conversation: "*So at the moment it has largely been probably more on a casual basis that [he] comes to us with something*". Nine projects were initiated from formal, face to face meetings. However, whilst the meetings were considered 'formal' due to their structure, agenda and regularity it was many of the informal moments that happened within those formal structures that was when many innovative things came up: "*wow, you know the brainstorming that went on in the plane and at dinners was like, well we can do that. We can do that. We can do that.*"

*And that's really valuable," and "over the beer afterwards. Actually a lot of the innovation is done at the end."* It was unable to be determined from our data how many of the projects that were initiated in these formal meetings came up within a discussion on the agenda and how many came up in the breaks, meals, or side tracking from the agenda.

In the unsuccessful projects, again both three projects were initiated in a formal way and the remaining six more informally. However, three projects perhaps could have had more formality in their design with two failing due to lack of coordination processes and one from when there was an arduous relationship and the idea's originator felt that it didn't proceed due to a personality clash with the decision maker. Perhaps a more formal process could have either seen the project go ahead or the idea originator feeling it was at least given a fair consideration through a due process.

### **3.3.5 Content**

Mohr and Nevins' (1990) final communication strategy is content. A review of the extant literature on communication content led to the following propositions.

Proposition 11: Influence strategies affect the chains' abilities to successfully co-innovate.

Proposition 12: The type of knowledge shared influences the chains' abilities successfully to co-innovate.

In determining if the communication between chain partners was direct or indirect the data was analysed for the language used in the participants' retelling of the stories of communication they had with their chain partner. In all three chains the language they used was indirect. Almost all the conversations were reported to be discussions, asking questions and giving suggestions. Such as, *"if there's an issue we'll go straight to [them] to talk about what we need to do."* And *"they're pretty open to discussions on the marketing side, for example, we [had] lots of conversations maybe three or so months ago just about their thoughts on rebranding."* Even participant accounts of disagreements with the partner was absent of direct language, *"We had a position and he had a position and we compromised, both of us to get to where we needed to be."* Whilst there were some examples of requests,

a form of direct language according to Frazier and Summers (1984), in all of those examples there was the implication that the partner had the choice to say yes or no. There was not a single example of being heavy handed using a threat, promise, plea to an obligation or legal threat reported between chain members in any of the chains.

In contrast, seven participants, across all the business used direct language retelling a situation with another chain member outside of the dyad: “[the retailer] has put this demand on us” said a member of the trading chain and “Yeah well as of Thursday they're being told to do it” said a chain member about contract growers.

In looking at the 26 successful projects the communication influence strategies used were all indirect in nature. Whilst the participant project descriptions involved requests, questions and seeking information, in none of the accounts did a participant report a direct request used by a partner with the implication that their counterpart must comply promptly, to something that is not in their best interest which is how ‘request’ is defined by Frazier and Summers (1984). To illustrate this, one supplier explained that they were asked by their partner to supply in a certain tray for a US customer, “So they just came to us saying they had a customer that would like it direct”. At face value, this may appear to be a direct request, however, in the context of the rest of the account we hear that this request was in fact opening up a discussion about the opportunity and ultimately the decision was made by both parties in the best interest of the chain. The interests weren’t solely in the marketers’ favour and the supplying partner was free to say no: “So we did the numbers, worked out the freight, what we were going to lose on freight but what they were going to gain on the sales and also not repacking it out of a normal box into an RST there... had a chat with them about it and decided it would all work”.

In looking at the nine unsuccessful chain projects and the participant reasons for the project failure, direct influence strategies such as promises, threats, legal pleas or obligations weren’t mentioned or implied as a factor in any of the projects. Moreover, the participant accounts of the stories were consistent in reporting indirect communication between the partners.

In the interviews participants were asked what they communicated about with their chain partners. The data was examined for if the content was explicit information such as transactional details (e.g. pricing, volumes, purchase orders), operational (e.g. logistics, fulfilment, packing instructions) or more tacit knowledge that requires a much closer understanding of each other's business, such as strategy, deep consumer or market insights or complex quality issues. All participants in all three chains could give examples of explicit information shared. Such as, *"I also send them quite a detailed ship report each week."* And *"he's looking to me for information about the crop. You know, what volumes are we expecting what fruit size are we looking at."* And *"[the offer] a product, the availability and pricing... [the confirmation] the ship to information, the quantity, the material. I'll do the contract, then work with [my counterpart] on a purchase order and a delivery schedule."*

When it came to tacit knowledge, however, the collaborative chains, shared much more of this hard-to-describe information, than the trading chain. All but one participant from the collaborative chains could give an example of shared information that had been built on years of working together, *"We've always got a 10 year rolling strategic plan on apples and he's very much part of developing that"*. Likewise the examples of shared information that is difficult to impart via an email or a phone call. Such as this example discussing how the two people in this situation arranged a face to face meeting at the pack shed due to the need for more than just words to impart the necessary information, *"This year we had massive hail storms that came through our growing regions and it sort of created a nightmare so we had these discussions that were like look we've had hail and its amounted to quite a bit of volume, you know what do we do?... And so you can have that conversation over the phone, but until you actually see the fruit in a bin, on the line, in a box you don't get a feel for how we are going to manage this. Here's where we draw the line. That piece of fruit is in, that's out and now I know what to pack to and you know what you're selling and you can like indicate to your customer this is the product we're marketing."*

In contrast, only three out of 11 trading chain participants said they've only ever given or received transactional information with the chain partner in the study and even then strategic discussions between even the leaders in the trading chain were limited, *"So we*

*have those more strategic discussions but it would only be 20% of the time.”*, said one of the trading chain leaders.

When looking at the successful co-innovation projects to determine the effect on co-innovation in the chain, fourteen of the 26 successful co-innovation projects were based on explicit knowledge. The projects were mostly operational or tactical in nature such as the eight new package projects (such as a ‘snack pack for small fruit and; 4 processes (such as new forecast project and an online shipping portal) and two new products, both which were taken from another market.

There were 12 successful co-innovation projects where tacit knowledge sharing between the partners was required. These were, for the most part, the larger scale projects for example, the four new business models such as setting up joint off shore growing groups; creating a joint venture export business and developing a network of brand development reps; there were four projects that were about accessing a new market or new customer, two packaging projects (one with protected technology) and two new product projects which were both proprietary varieties.

In considering the influence of tacit knowledge on innovation we also looked at how tacit knowledge appears (or not) in the unsuccessful projects. In three of the nine projects there was critical information that was missed, not because it was withheld, but it was tacit information that the partner that should of, or could of imparted didn’t realise the importance to their chain partner, whilst the other partner didn’t know what they didn’t know so didn’t ask, *“in hindsight I would have asked how many growers do you think we should include in this program”* said one leader, lamenting it was something that their experienced partner would have been able to tell them but he didn’t realise he didn’t know.

### ***3.3.6 Conclusion to findings from applying Mohr and Nevin’s (1990) framework to the context of global agri-chains***

The above section details the participants’ responses to interview questions and participant accounts of co-innovation projects as they relate to the propositions adapted from Mohr and Nevin’s (1990) theoretical construct for communication strategies. It was found that the

communication practices most often used in these chain's successful innovation projects were indirect, informal, bidirectional, transparent and face to face communication.

Discussion on how these findings compare with that of Mohr and Nevin's (1990) use of the framework; what the findings of this study might mean for co-innovation in global agri-chains and a suggested model for how chain member communication in global agri-chains might influence co-innovation are presented in the second section of chapter 4. This communication model is then integrated with the other two constructs in section 4.5 as the application of this framework is intended to be part of a bigger picture in understanding how collaborative practices influence a global agri-chains' ability to co-innovate.

#### ***3.4.1 Findings from applying MacCormack et al's (2007) framework to the context of global agri-chains***

This section details the participants' responses to interview questions as they relate to each of the four pillars of MacCormack et al. (2007) 'Four Pillars to Collaborative Capabilities'. The findings are summarised in table 4.

**Table 4: Status of the architectural ‘Four Pillars’ to co-innovation (MacCormack et al, 2007) as determined by Nvivo analysis of the interviewees’ responses**

<b>Pillar</b>	<b>Element</b>	<b>C1</b>	<b>C2</b>	<b>C3</b>
<b>People</b>	Are chain members recruited for their co-innovation skills?	no	no	no
	Are chain members encouraged by leadership to co-innovate?	no	no	no
	Do KPIs encourage and reward co-innovation?	no	no	no
	Are there multiple gate influencers connecting the chain?	no	no	no
	Are cross boundary relationships cultivated amongst chain members?	yes	yes	some-times
<b>Processes</b>	Are there formal joint processes to coordinate co-innovation projects across the chain?	no	no	no
	Are there informal joint mechanisms for co-innovation projects across the chain?	yes	yes	no
	Does the chain conduct testing and pilot runs with a learning approach?	some-times	some-times	some-times
<b>Platforms</b>	Are there knowledge management systems to capture, transfer and assimilate chain knowledge across organisational boundaries?	no	no	no
	Is there joint technology to improve efficiency across the chain?	some	no	no
	Are there shared expectations rather than detailed formal contracts to govern the collaboration?	yes	yes	no
	Are there joint technical standards to ensure seamless data transfer?	n/a	n/a	n/a
<b>Program me</b>	Are there co-innovation programmes set up in these chains?	yes	yes	no
	Is there a senior person tasked with shaping	yes	yes	no

	the program?			
	Is the co-innovation programme set up for the long term?	yes	yes	no

The interviewees in chain one (C1) gave 17 examples of producing successful co-innovation outcomes. Technological innovations included the introduction of New Zealand created proprietary varieties into the USA market and establishing a grower group for those same varieties in the US for year round supply. Non technological co-innovations included new consumer targeted packaging styles and establishing in-market brand representatives to educate and excite store managers.

Chain 2 (C2) participants gave us seven examples of successful co-innovation outcomes. Technological innovations included new fruit varieties and modified atmosphere (MA) packaging to maintain freshness. Non technological co-innovations included a snack pack and jointly engaging a new customer that together they can supply year-round.

Chain 3 (C3) was a self-described arms-length trading chain. Despite this, participants gave two examples of successful co-innovation outputs. A technological innovation was a significant modification to the production process to reduce costs; and a non-technological innovation was jointly gaining a new customer.

### **3.4.2 People**

#### *C1 People*

Only one of the five people elements was present in C1 and that was, cross boundary opportunities were cultivated between the partners. 100% of C1 participants (n=15) gave examples of cross boundary activities. Examples included attending shows together, joint visits to customers and growers and joint strategy meetings which occurred several times a year. C1 participants told us that when a mixed member group got together face to face, it was beneficial for the chain's co-innovation activities in several ways. Information transfer was improved, *"I think there's a lot of merit being face to face... see first-hand what you are both referring to... it's more effective."* New ideas sprouted from the interactions, *"you know the brainstorming that went on in the plane and at dinners was like, well we can do that..."*



*And that's really valuable.” Stronger relationships were formed, “When you go on that trip... you meet them personally... I do think that that does help the relationship.” and over time, sharing became the norm. “We went to see [a customer] and he sat in as we pitched the New Zealand programme as well as [business that he was not involved in]. So, that's like complete open sharing.”*

C1 participants reported that when new people were recruited into the business, co-innovation skills were not a priority, instead industry experience was the most frequently mentioned criteria (n = 10) when hiring new team members. Leadership in C1 was not found to actively encourage (nor discourage) co-innovation. KPIs were found not to consider co-innovation with 10 of 13 participants in agreement that, *“Our objective is to get the best return to the grower.”* and whilst there were multiple gatekeepers connecting the chain, 10 of 15 interviewees also said that their chain relied on a narrow connection for important information and decisions. Some participants felt that opportunities could be missed because of this. *“Our senior team wants to be the primary contact person... if there were some opportunities for collaboration that weren't so widely communicated then it may be something that we weren't able to take advantage of.”*

## *C2 People*

Similarly to C1 the only element of the people pillar that was apparent in C2 was the use of cross boundary activities. All of the chain's participants could give examples of mixed group get-togethers and told us that regular cross boundary activities were part of the relationship and integral in creating, evaluating and educating on new proprietary varieties; *“We bring them in to understand the process you know... We spend a lot of time taking them to our field trials so they can see exactly what we have in a developed pipeline... Because they want to be out there and they have an opinion.”*

Also similarly to C1, none of the other people elements were found to be apparent in the chain despite successful co-innovation outcomes. Participants were recruited without consideration for co-innovation skills; *“just someone with experience in the industry”*, and leadership and KPIs were not found to focus on co-innovation. Also like C1, whilst there were multiple gatekeepers the major information exchanges and decisions were made

through a single point of contact. *“Really there's only, it's a relationship which [the CEO] has had for many, many years.”*

#### *C3 People*

None of the five people elements were apparent in this chain. Only four of 11 trading chain participants could give a cross boundary example compared to 100% of participants in the collaborative chains. C3 did not specifically seek co-innovation skills when recruiting; management did not encourage co-innovation; KPIs did not encourage or reward co-innovation, and there were only a few gatekeepers connecting the businesses.

### **3.4.3 Processes**

#### *C1 Processes*

Of the three processes elements, only one was found to be present in C1 which was the use of informal processes to manage co-innovation. Participants were consistent in descriptions of informal processes for evaluating pack styles, the development of new variety opportunities and joint meetings acting as a forum for idea generation. We were told that there were no formal co-innovation processes, *it's not formal...we just tend to keep on top of it ourselves.”*

Testing and pilot runs were only occasionally part of co-innovation projects, with participants giving some examples of pre-market testing but many projects were launched without testing. Consumer testing was something that had been conducted in the past but was not a current focus in the chain. *“I've really got no interest in finding out whether people like [this variety] or [that variety].”*

#### *C2 Processes*

Also similarly to C1 informal processes, particularly for evaluating and production planning of new varieties, were evident, *“We agree on lots of things, from the varieties that we choose to bring into quarantine to the planting schedules...there's a [production] cap on every variety which we all have to agree to raise”* yet no formal chain co-innovation processes were reported. Testing and pilot runs were ad hoc. Consumer testing had also been conducted more in the past than presently, *“It's expensive, there's a real lack of people*

*who understand how to use it...for a long time we've paid a lot of money for [scan] data and we didn't use it to its full effect."*

### *C3 Processes*

None of the process elements were apparent in C3. Whilst there were well established internal processes in the supplying business, there were no joint processes formal or informal, and pilot runs were not part of the co-innovations mentioned.

### **3.4.4 Platforms**

#### *C1 Platforms*

The platforms element most apparent in C1 was the use of relational expectations to govern chain behaviour. Eight of the 15 participants who discussed governance said that there was a contract between the two parties but it was a "*we're marketing your fruit type deal*", and "*it's commission based... but I don't know too much about it*" All but one of those interviewees said that they had non-contractual expectations of the partnership which were based around trust, fairness and loyalty. "*The piece of paper says that we are going to sell fruit for them but I think that we have created a relationship that is far beyond that...we know that everyone's working for the best interests and you can't write that into a contract.*" There were also several examples of how these non-contractual expectations benefitted the chain including the protection of co-innovations. "*There's a lot of internal protection. We've got a variety in the US... that's not protected anymore. But because it's within the grower base they withhold the material... they respect what we've got going.*"

In regards to joint technology, both businesses in C1 could view in real time the NZ grown product allocated to the US market, and the US grown fruit once it had been packed and barcoded. This was important for a more coordinated and profitable product placement, however, it wasn't clear how this supported co-innovation except for perhaps the saved resources through operational efficiency can go to innovation activities. With the inventory software as the exception, C1 was managed by whatever means individuals chose to organise their own projects such as Excel and conference calls.

A systematic way of capturing and sharing chain knowledge across business boundaries was

absent in C1. Likewise, establishing joint standards was absent but this was because it was found to be unnecessary. Eight of 15 chain one participants acknowledged some small differences in terminology between the US and New Zealand, yet not one person thought those differences were a barrier to chain activities.

#### *C2 Platforms*

The use of shared expectations for governance was again the only platform element apparent in C2. All three participants said the legal contract wasn't central to the relationship and that shared expectations bound them, *"It's a bit like a marriage."* Also as seen in C1, there were examples on where trust and loyalty kept the chain together: *"We've had our customers ask to ship to them directly...we have opted not to do that because of our business relationships are more important to us."*

In contrast to C1, there was no joint technology connecting the chain. However, similarly to C1, chain ideas, knowledge and experiences were stored in individual's emails and personal notes and developing joint standards and common language was viewed as unnecessary.

#### *C3 Platforms*

None of the platform elements were apparent in C3. There was no systematic way of capturing and sharing chain knowledge across business boundaries, no joint technology and unlike the collaborative chains, the relationship was guided by short term, transactional contracts. Similarly to the collaborative chains, the creation of joint standards was not considered necessary.

### **3.4.5 Programmes**

#### *C1 Programmes*

C1 used a programmed approach for its chain activities. The most senior representative of each business in C1 were consistent about the collaborative programme's purpose: information sharing, strategic planning, idea generation, goal setting, chain alignment and coordination. It was also evident that co-innovations emerged from this forum: *"I think that the best example of that is with this collaboration with the other off shore marketers... we took [retail] executives to Logistica in Berlin and on the way stopped in London for two days*

*[for] a retail tour of London. We saw all the retailers in the UK All the packaging, all the merchandising, all the things they are doing and the [retail] guys were like, wow... we can do that."*

The C1 programme was senior led and long term: *"[at the last meeting we] really tapped into a market plan through to like 2022... and I think very few, agribusiness operations, particularly in horticulture, would have that capability in New Zealand and Australia. Really drawing in a long term plan with distributors off shore,"* said one CEO.

#### *C2 Programmes*

C2 also had a programmed approach to their chain activities which was senior led and set up for the long term *"[the CEO] built our model, and he's been doing this for probably 15 or 18 years,"* Also as seen in C1, it was out of these programmes that the key co-innovation outcomes emerged, particularly in terms of new varieties and related non-technological innovations such as consumer targeted packs and jointly created business practices.

#### *C3 Programmes*

The trading chain differed from the collaborative chains in all aspects of this pillar and none of the programme elements were apparent due to the transactional nature of the relationship. *"Generally speaking we don't like to work with traders we like to work with end customers 'cos your questions before around innovation and new product development, traders typically don't do that"*

#### **3.4.6 Conclusion to findings from applying MacCormack et al's (2007) framework to the context of global agri-chains**

The above section details the participants' responses to interview questions and participant accounts of co-innovation projects as they relate to the propositions adapted from MacCormack et al's (2007) four pillars of collaborative capabilities. The pillar found to be the most prevalent in the two collaborative chains' architectures was 'employing a programme approach to chain activities'. This was where the collaborative chains were both most closely aligned with the extant literature and most differentiated from the architecture of the trading chain in this study.

Discussion on how these findings compare with that of MacCormack et al's (2007) use of the framework; what the findings of this study might mean for co-innovation in global agri-chains and a suggested model for how chain member communication in global agri-chains might influence co-innovation are presented in the third section of chapter 4. This architectural construct is then integrated with the other two constructs in section 4.5 as the application of this framework is intended to be part of a bigger picture in understanding how collaborative practices influence a global agri-chain's ability to co-innovate.

### ***3.5 Results chapter summary***

This chapter presented the findings from the participant's responses to interview questions and accounts of successful co-innovation projects as they relate to the three chosen frameworks, namely; 1) Hansen and Nohria's (2004) four barriers to collaborative engagement; 2) Mohr and Nevin's (1990) theoretical communication strategies; and 3) MacCormack et al's (2007) four pillars of collaborative capabilities.

The findings from applying Hansen and Nohria's (2004) model to explore employee engagement in the context of global agri-chains were that willingness was not a barrier in the collaborative chains but possibly a barrier in the trading chain. Participants from leadership groups had a greater ability to access and use partner information to co-innovate than non-leadership participants. The key difference between the collaborative chains and the trading chain was the collaborative chains reported more willingness both in seeking input and in information transparency than the trading chain. The collaborative chains also demonstrated greater ability to transfer tacit knowledge than the trading chain.

The findings from using Mohr and Nevin's (1990) model to investigate communication practices in the context of global agri-chains were the communication practices most often used in these chain's successful innovation projects were indirect, informal, bidirectional, transparent and face to face communication.

The findings from applying MacCormack et al's (2007) pillars of collaborative capability, to examine the architecture of global agri-chains found that the pillar which was the most prevalent in the two collaborative chains' architectures was 'employing a programme

approach to chain activities'. This was where the collaborative chains were both most closely aligned with the extant literature and most differentiated from the architecture of the trading chain in this study.

Chapter 4 now discusses these findings in relation to the literature, both individually and the frameworks in integration.

## **Chapter 4: Discussion**

### ***4.1 Introduction***

This thesis applies and integrates three existing collaboration frameworks developed in non-agricultural industries to three global agri-chain case studies to investigate and extend the current thinking on how agri-chain collaborative practices might influence the chain's co-innovation capabilities.

The three agri-chains in this study were all exporting / importing agricultural products across the Pacific Ocean between Australasia (Australia / New Zealand) and North America (USA / Canada). Of the three chains, two of them were self-described as collaborative by the management of the individual businesses. Both these chains handled proprietary, branded fruit varieties; the businesses had spent many years developing a joint business model. They had mechanisms for transparent information sharing (particularly in forecast planning and sales reporting), and frequently worked together on collaborative projects. The third chain was self-described as in a trading relationship which was a conscious strategic decision by management. In the trading chain the partners conducted their business contingent on price, shared less information with each other and entered into fewer joint projects.

This discussion chapter is structured as follows:

4.2 – 4.4 discusses the key findings and unique contributions from each of the three areas of interest in this research (engagement, communication and architecture). For each area of interest, a guiding framework developed in a non-agricultural setting was selected and used as a lens to explore a key theme in the global agri-chain context. I discuss what these findings might mean for co-innovation in global agri-chains, compare and contrast my findings with the original framework and discuss how this work has extended each framework.

4.5 brings the three frameworks together discussing the connection between the elements in reference to the literature and suggesting a speculative model for how these frameworks might integrate to influence co-innovation capability within agri-chains.



4.6 Discusses the differences found between these agri-chain case studies and the extant literature in high-tech chains.

#### ***4.2.1 Exploring 'engagement' using the Hansen and Nohria (2004) framework as a lens***

Chapter 3, section 2 presented the findings of how engagement between chain members might influence their co-innovation capability using Hansen and Nohria's (2004) framework. Hansen and Nohria's (2004) work identified how to build collaborative advantage through eliminating barriers of unwillingness to seek input and learn from others and an unwillingness to help; and inability to seek and find expertise and inability to work together and transfer knowledge. The framework was developed by surveying over 100 single firm, multi-unit, multinational organisations. Participant companies included BP, GlaxoSmithKline and Morgan Stanley. However, no agribusiness chains were used.

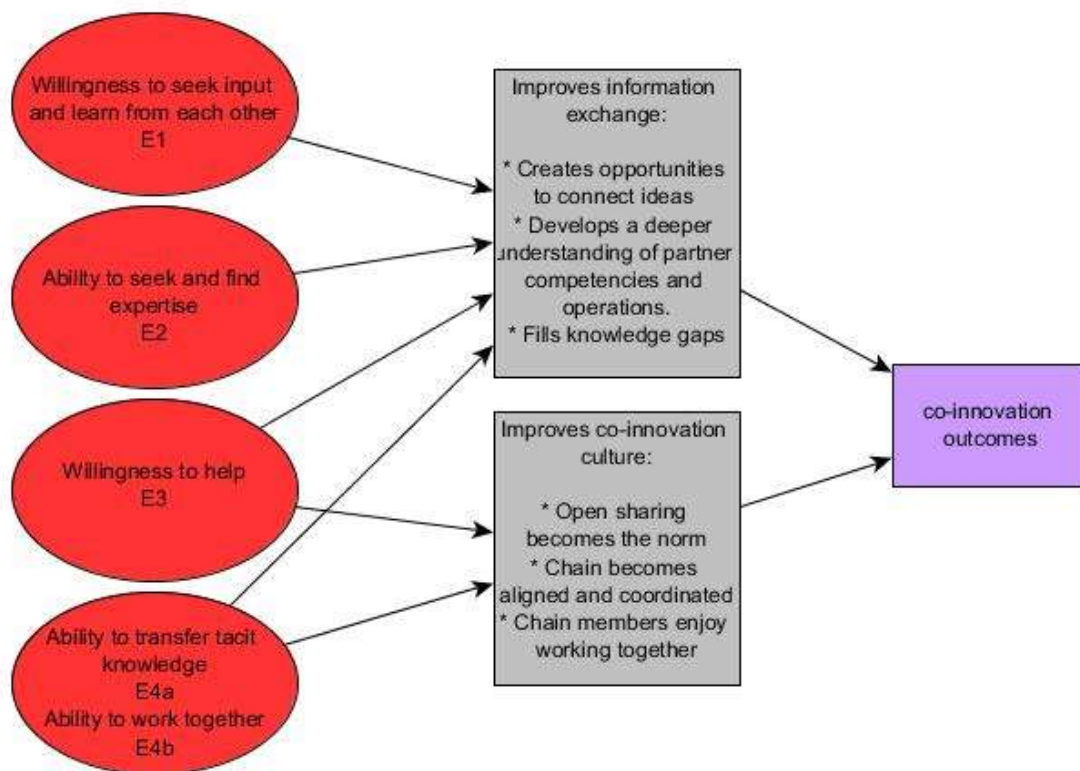
#### ***4.2.2 A discussion on my findings using the Hansen and Nohria (2004) framework***

In these chains, the study findings suggest, information exchange was improved by a willingness to seek input (E1) an ability to seek and find expertise (E2) and an ability to transfer tacit knowledge (E4a). A willingness to seek input opened up a channel of communication which led to discussions and consideration of the issue in question and through the additional chain information, feedback and thought new connections and better decisions could be made. An ability to seek and find expertise and an ability to transfer tacit knowledge led to chain members having a deeper knowledge of partner competencies and operations which led to partners being able to leverage that information and make new connections with the expertise and perspectives of other chain positions.

The study findings also suggest a culture of co-innovation was established through a willingness to help (E3) and an ability to work together (E4b). A willingness to help appears to influence co-innovation through the transparency it provides, building a trusting environment in which collaboration can occur. When open sharing is the norm (as opposed to being transparent about a particular area of the chain that has been selected for innovation) collaboration in the chain also becomes a norm (Grams, 2012). This was evident in the collaborating chains where transparent information sharing was normal and regular chain strategy and planning meetings were part of chain business practices. Out of these

meetings came some of their best co-innovation projects. The ability of chain members to work together (E4b) is important for an environment where chain members can speak openly with understanding. Both the ability to access information and give information was moderated by the hierarchical level of participants within the chain. Senior executives were more involved in cross chain situations than non-management giving them greater access for bidirectional information sharing. This led to leaders having a greater ability to both access information and share information producing a group with a deeper understanding of their partner's competencies and operations and thus leaders were more able to make connect ideas (E2 and E4).

**Figure 1: Suggested model for how chain member engagement in global agri-chains might influence co-innovation**



#### **4.2.3 How my findings compare with the Hansen and Nohria (2004) framework**

The findings presented in chapter 3, table 1 show that the collaborative chains were found to be willing (or mostly willing) to seek help and learn from their partner and willing (or

mostly willing) to help their partner by sharing information and expertise across the chain. In contrast, the participants of the trading chain were found to be unwilling to ask for help from their partner when required and less willing to share expertise with partners. Thus, my findings provide strength to Hansen and Nohria's (2004) framework where the relational barriers of willingness are lower (ie, individuals are more willing to act) in the collaborative chains than the trading one.

The collaborative chains were able (or mostly able) to seek and find expertise and able (or mostly able) to work together and transfer knowledge. Whilst the trading chain was found to be equally able in individual's ability to seek and find expertise, trading chain participants were possibly unable to transfer tacit and technical knowledge. The collaborative chains overcoming the knowledge related barriers was aligned with collaborative teams in Hansen and Nohria's (2004) framework, however, since the participants in the trading chain were also able to seek and find expertise within their partner organisation, this indicates that an individual's ability to seek and find partner expertise may be necessary to collaboration, but not sufficient for collaboration by itself.

#### ***4.2.4 My extensions of the Hansen and Nohria (2004) framework and what that might mean for co-innovation in global agri-chains.***

Hansen and Nohria's (2004) research was conducted in complex single firm, multi-unit, multinational organisations. This research extends their model into global agricultural chains. Whilst both Hansen and Nohria's (2004) work and this project required multi levels of analysis, this work extended the use of their framework to a different unit of analysis. Hansen and Nohria (2004) surveyed individual executives to understand collective attitudes of their business units and how those business units might collaborate with other geographically spread out business units. I interviewed individual managers to understand collective attitudes of their businesses and how those businesses might collaborate with a business partner up or down stream in chain collaboration. The collaborative teams in both studies were geographically spread out, comprised team members from different cultures and backgrounds and working on different parts of ultimately the same outcome. The Hansen and Nohria (2004) framework therefore was found to apply well in a global value chain context.

An unexpected finding from this study, and a further advancement of the Hansen and Nohria (2004) framework was that several of the engagement practices were moderated by the organisational level of chain participants. Whilst there wasn't a big difference between senior executives and lower level team members in terms of willingness, there was a notable difference between senior executives and lower level team members in their ability to seek and find expertise and transfer tacit and technical knowledge (table 3-1). Senior executives were more involved in boundary spanning activities with the partner business giving them greater access to information and expertise from the partner business, thus resulting in senior executives gaining a greater understanding of their chain partner and also having more opportunity to transfer tacit and technical knowledge.

Whilst chain member hierarchy wasn't an original area of interest at the outset of this study, this finding has some support in the literature. Aiken et al. (1980) found that organisation department heads were more likely to make innovation proposals than lower level organization members, and that the lower level organisation members who make the most innovation proposals have the most contact outside the organisation. Warkentin et al. (1997) also concluded that opportunity for information exchange is partly influenced by organisational status, because lower level members often don't have the same opportunities to be involved as the senior management team.

A final extension of the Hansen and Nohria (2004) framework is the suggested model on how willingness and ability of chain individuals might influence the chain's ability to co-innovate (figure 1). It is posited that chain member engagement influences co-innovation in two broad ways. The first is by improving information exchange and the second by building a culture of co-innovation. This will be discussed in more detail in section 4.5.

**Table 1: Summary of how the Hansen and Nohria (2004) framework has been extended by this work**

<b><i>The Hansen and Nohria (2004) framework</i></b>	<b><i>My extension of the work</i></b>
Developed from a non-agricultural context	Applied to global agricultural chains
The unit of analysis is individual executives to understand the collective attitudes of their business units and how those business units might collaborate with other business units	The unit of analysis is individuals to understand the collective attitudes of their businesses and how those businesses might collaborate with a vertically connected business partner
Organisational hierarchy wasn't included in the framework	This study found that in these cases engagement practices were moderated by the organisational level of chain participants
The original framework focus is on management levers to overcome the barriers	I suggested a model where individual engagement influences co-innovation in two broad ways: 1) by improving information exchange; and 2) by building a culture of co-innovation

#### ***4.3.1 Exploring 'communication' using Mohr and Nevin (1990) framework as a lens***

Chapter 3, section 3, presented the findings on how the communication practices used by the case chains in this study might influence their co-innovation ability using Mohr and Nevin's (1990) theoretical framework on communication strategies in marketing channels. This model aimed to align communication strategies of frequency, direction, modality and content with channel conditions of structure (relational vs market), climate (supportive vs unsupportive) and power (symmetrical vs asymmetrical) to enhance communication outcomes. The assumption in this model is outcomes are enhanced if communication strategies match channel conditions (Mohr & Nevin, 1990). This model was developed to reflect the findings of data that were collected from a national sample of computer dealers and did not include agribusinesses.

#### ***4.3.2 A discussion on my findings using the Mohr and Nevin (1990) framework***

##### *Frequency*

I can't say that there was a direct link between frequency of communication and co-innovation when communication frequency wasn't mentioned as a success factor in the successful projects, nor was lack of frequent communication viewed as a factor at fault in the failed projects either. However, frequency of communication was found to be a common practice in all three chains, particularly the collaborative ones, which suggests it may be of significance in value chain behaviour. High communication frequency has been empirically found to be linked with higher perceptions of communication quality (Mohr & Sohi, 1996) and influence trust in relationships (Anderson & Weitz, 1989) cooperation (Anderson & Narus, 1990) and commitment (Hunt & Morgan, 1994). It is therefore possible, that the high frequency of communication in these chains is an indirect contributing factor to co-innovation by building the chain trust, cooperation and commitment which facilitates co-innovation. Furthermore, it has been suggested that frequency leads to greater opportunities for links to be made (Monge et al., 1992), therefore it is also possible that there may have been an opportunity for the missed pieces of information to have been exchanged in the failed projects had there been more communication within the project.

Similarly to communication frequency, communication satisfaction wasn't mentioned by the participants as a factor in the successful or unsuccessful outcomes of the chain co-innovation project. However, communication satisfaction was a factor reported as present in all three chains. We posit that communication satisfaction may still be an influencing factor in co-innovation. Mohr and Sohi (1996) found a link between high communication satisfaction and communication quality, which they defined as completeness, credibility, accuracy, timeliness and adequacy of communication. Johnson et al. (2001) found that communication quality was linked to perceived innovativeness, particularly in highly complex or difficult tasks. I find it plausible that this connection is what is occurring in these chains also, that the high levels of communication satisfaction may be leading to a better quality of communication which is supporting their co-innovation activities.

### *Direction*

Our findings are consistent with other intercompany research that has found bidirectional flow to be an important behaviour for strong chain relationships (Yoo et al., 2014; Dwyer et al., 1987; Mohr & Nevin, 1990) and strong chain relationships are acknowledged as a requirement for co-innovation (Fearne, 2009). However in looking at both the successful and unsuccessful projects it appears that bidirectional flow of information is also particularly important for filling in information gaps for the partner company. Participants reported how important it was to receive feedback and ideas from their partners in descriptions of successful projects, and lamenting information that they didn't have, and wish they had asked about in unsuccessful projects. This finding is also consistent with other research into the connection of diverse ideas and perspectives being important for co-innovation (Santos et al., 2004; Zhang et al., 2010).

Transparency was found to be higher in the collaborative chains than in the trading chain and present in the successful co-innovation projects. In many cases the participant examples of sharing commercially sensitive information wasn't about connecting different pieces of the puzzle to create new ideas as discussed in the literature (Santos et al., 2004; Zhang et al., 2010). More frequently, the information shared afforded greater chain coordination of day to day activities (particularly inventory control), increased efficiency within the chain and better decision making from having a more complete view of the chain. We suggest that whilst the link of transparency to innovation can be through individual pieces of information forming a new idea, more often innovation comes about through the underlying culture of transparency developing trust within the relationship and building a trusting environment in which collaboration can occur. When open sharing is the norm (as opposed to being transparent about a particular area of the chain that has been selected for innovation) collaboration in the chain also becomes a norm (Grams, 2012).

### *Modality*

Contrary to Barry and Bateman (1992) who found the phone to be the most critical mode used in these chains due to its flexibility and capability to transmit large amounts of information, we found a slight preference for email in day to day activities because of its ability to transmit information accurately, across time zones and sometimes as a personal

preference. In terms of innovation, however, I found that face-to-face meetings were deemed by the participants to be useful in both building rapport with chain partners and transferring knowledge that is difficult by other means. Face-to-face was the most successful mode in terms of initiating co-innovation projects which is consistent with the Daft and Lengel (1986) view that the more ambiguous the task then the greater need for a richer mode of communication. Innovation, by its very nature, is an ambiguous task. Face to face communication, however, isn't a guarantee that the right information is exchanged, the right questions and feedback doesn't just happen because you are face to face. Informal communication was said to be used almost twice as often as formal communication in the generation stage of the innovation projects. Furthermore, as noted in the findings several ideas that were said to be born out of the formal meetings, the ideas came up in the informal moments of the meeting (for example, when the group was at dinner) as opposed to part of the formal agenda. Therefore, informal communication appears to be particularly important for the mixing of ideas and creating new ones to initiate co-innovation projects however the formal communication structures may create the process and structure in which partners can meet and generate ideas and the ideas can be evaluated and progressed. This may be why there is some disagreement in the literature around how formality influences co-innovation, and why other researchers suggest both is required (Hunt & Morgan, 1994).

### *Content*

These findings must be considered in context. Frazier and Summer's (1984) empirical research of influence strategies found that the manufacturer-dealer relationship in the car industry is characterised by high partner cooperation and dependency. The three chains could be characterised in a similar fashion, particularly the two collaborative chains with their long-term commitment to the joint development of branded proprietary varieties. However, even the trading chain, though the partnership was not as interdependent as the collaborative chains, still had a good history of working together and a well-developed relationship. Because of this, these chains are more likely to use indirect influence strategies because it is important to them to maintain a trusting and collaborative atmosphere (Frazier & Summers, 1984).

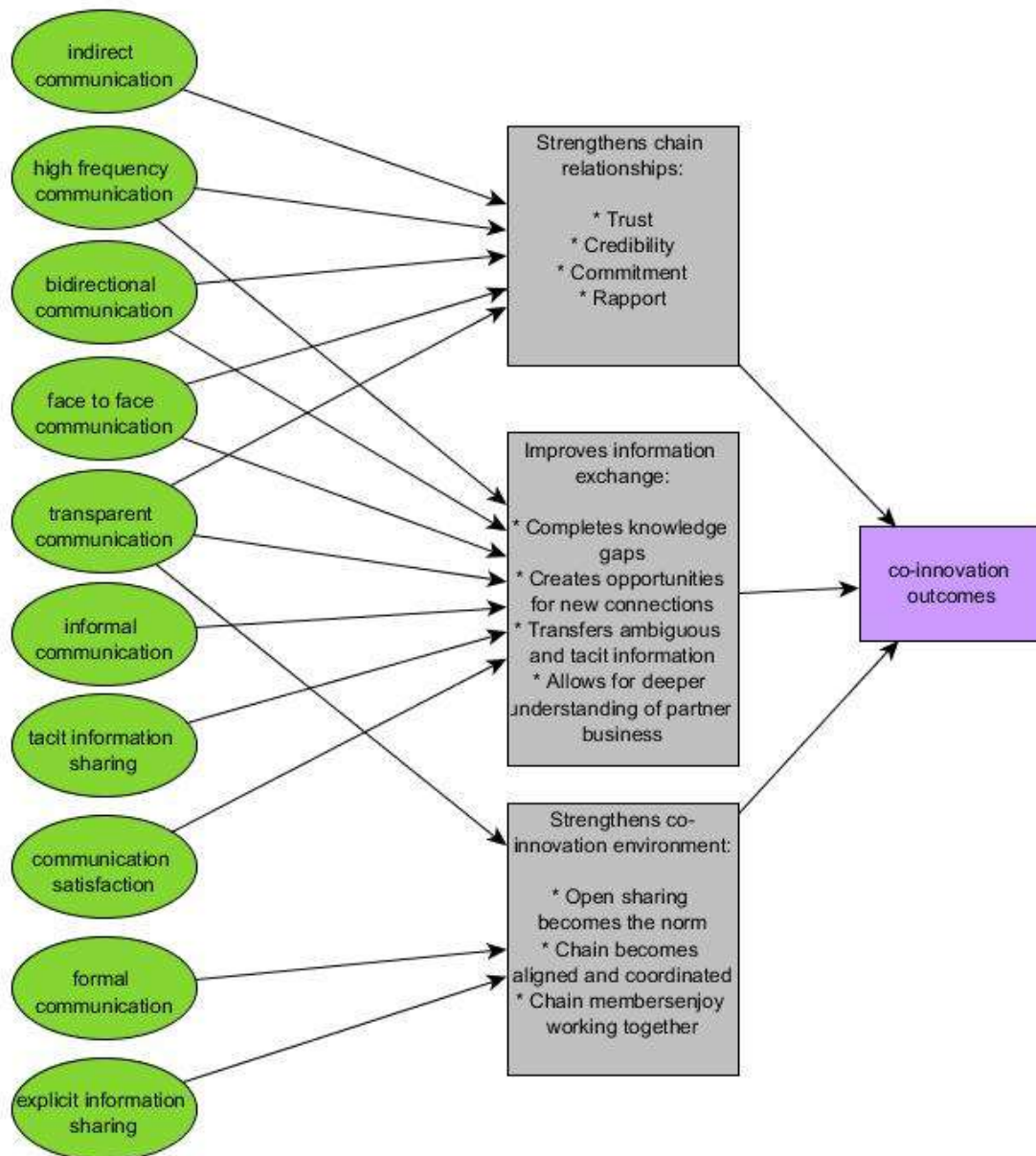


This isn't just a case of the existing close relationship leads to indirect communication, however. Frazier and Summers (1984) also found that over-time, information exchange should strengthen the relationship by building greater credibility and interdependence. Moreover they found indirect strategies to be positively correlated with agreement and beneficial in resolving conflict (Frazier & Summers, 1984). Indirect strategies are also positively related to trust (Kumar, 1996; Yoo et al., 2014). In a collaborative relationship the key contacts are likely to want to establish credibility and rapport in which to be in a good position to continue to influence the chain partner in future discussions. This suggests indirect strategies make good business sense for collaborative partnerships. The strategy may take more time and energy than a direct influence style but is more likely to foster an environment suitable for a co-innovation.

All three chains required the sharing of explicit knowledge for day to day operations. The collaborative chains also shared more tacit knowledge than the trading chain. Either type of knowledge can be used successfully for co-innovation, demonstrated by the almost evenly split between projects based on explicit knowledge only (n=14) and those requiring tacit knowledge (n=12) which is in contrast to (Nissen et al., 2014). However, whilst I don't know the value of each of the projects, the nature of the projects that required tacit knowledge appeared to be much larger and likely to provide a more sustainable competitive advantage than those projects that were based on explicit knowledge, which is consistent with (Park et al., 2015).

Looking at how all these communication practices fit together, we note that there are three broad ways in which these factors influence co-innovation. 1, through the building of chain relational aspects such as trust, credibility, commitment and rapport. 2, through improved information exchange; filling in knowledge gaps for partners, finding opportunities for diverse knowledge from different perspectives in the chain to come together, transferring ambiguous and tacit information and improved information exchange quality, in terms of completeness, accuracy and timeliness. 3, through creating cultural and structural support for co-innovation where sharing becomes the norm and there are appropriate structures and coordination in place to take advantage of the information being exchanged.

**Figure 2: Suggested model for how communication practices in agribusiness export chains influence co-innovation**



#### **4.3.3 How my findings compare with the Mohr and Nevin (1990) framework**

In chapter 3, table 3 the summarised findings show that the collaborative chains were found to have highly frequent, bi-directional, (mostly) informal and indirect communication. This supports the Mohr and Nevin (1990) model which posits that those same facets suit relational, supportive and symmetrical relationships. Further support came from looking at

the case chain outcomes, which in my research were measured by successful co-innovation projects. The communication styles reported to be utilised in successful co-innovation projects were bi-directional, informal, indirect, transparent and face to face communication. Despite frequency not being specifically mentioned as a communication practice of co-innovation projects it was mentioned as a routine practice of the chain, and therefore the communication practices used for collaborative outcomes were as expected from the model.

The findings from the trading chain didn't fit quite as neatly into the Mohr and Nevin (1990) model. They were found to be frequent communicators (although not quite as frequent as the collaborative chains) and using bi-directional, indirect and mostly formal communication practices. Whilst these findings are not as far on the continuum of relational, supportive and symmetrical relationships as the collaborative chains, the findings are closer to that of the communication practices of the collaborative chains than expected. This may be because the market relationship between the trading chain members is relatively symmetrical and supportive. Since the relationships have aspects of both market and relational elements, it fits that their communicating practices also include aspects of both elements.

#### ***4.3.4 My extensions of the Mohr and Nevin (1990) framework and what that might mean for co-innovation in global agri-chains***

Mohr and Nevin (1990) suggested that further research in other industry contexts could extend their model. The model has been extended to manufacturing and service industries (Peters & Fletcher, 2004) however, a review of the literature has determined that this is the first time the framework has been applied to an agri-chain context. The Mohr and Nevin (1990) framework emphasises communication at the core of the channel performance and thus I found the model to be relevant when applying it to investigating communication as a core practice in global agri-chains.

In addition to the application of the framework in an agri-chain context and using co-innovation projects as an outcome measure, I added constructs to the framework which arose from other supporting literature in the field. In addition to Mohr and Nevin's (1990) four facets of frequency, bi-directionality, indirect and informal language, I included

satisfaction of communication frequency, transparency, the mode of communication and the type of information transferred (tacit or explicit). These additional elements were included because from reviewing the literature I thought that these communication elements may also help explain influential communication practices on co-innovation in value chains. With the exception of satisfaction of communication frequency, the other three additional communication elements were found to be present in over half the co-innovation projects indicating that they too are likely to play a role in communication for co-innovation outcomes in these chains. Thus I consider these additional elements a useful addition to the framework.

The findings in chapter 3 led to the development of a suggested communication strategy model described here in the discussion chapter, for how communication might improve co-innovation outcomes in the agri-chain context. Figure 2 suggests relational and supportive communication practices can positively influence co-innovation in agricultural export chains in three ways; 1) by strengthening the relationship of the chain; 2) by improving information exchange within the chain; and 3) building the cultural and structural support for co-innovation.

**Table 2: Summary of how the Mohr and Nevin (1990) framework has been extended by this work**

<b><i>The Mohr and Nevin (1990) framework</i></b>	<b><i>My extension of the work</i></b>
Developed from a national sample of computer dealers	Applied to global agricultural chains
The original framework used four facets of communication: frequency, bi-directionality, indirect and informal language	In addition to the original four facets I also used satisfaction of communication frequency, transparency, the mode of communication and the type of information transferred (tacit or explicit).
The original framework explored channel outcomes of coordination, satisfaction, commitment and performance	I suggest relational and supportive communication practices can positively influence co-innovation in agricultural export chains in three ways; 1) by strengthening the relationship of the chain; 2) by improving information exchange within the chain; and 3) by building the cultural and structural support for co-innovation

#### ***4.4.1 Exploring architecture, using MacCormack et al's (2007) framework as a lens***

Chapter 3, section 4, presented the findings on how chain architecture might influence co-innovation in agri-chains using MacCormack et al's (2007) framework. MacCormack et al. (2007) proposed the 'Four Pillars of Collaborative Capabilities' which are: people, process, platform and programme. This framework was developed from studying the strategies and practices of over 100 managers from 20 high-tech industry businesses that were successfully making extensive use of collaboration in their innovation efforts.

#### ***4.4.2 A discussion on my findings using the MacCormack et al (2007) framework***

To better relate the findings with the existing literature we suggest that whereas (MacCormack et al., 2007) treated each of the pillars as stand-alone structures, we found that the apparent elements of the first three pillars (people, processes and platforms) were

not structures of the individual businesses, but sub-structures of the chain's joint programme (figure 3). Thus the lack of elements is potentially indicative of a chain that has not yet reached full collaborative organisation.

A further extension of the MacCormack et al. (2007) framework is how the integrated elements achieve co-innovation. I suggest, the programmed approach (P4) with its substructures of people (P1); processes (P2), and platforms (P3) supported the collaborative chains co-innovation activities in three broad ways: 1) by improving information exchange; 2) by building a culture of co-innovation, and 3) by strengthening the chain relationship (figure 3).

#### *Improving information exchange*

Arranging for chain members to regularly meet face to face to share information, coordinate work and brainstorm ideas appeared to improve information exchange within the chain. Participants who attended these cross-boundary events gained a deeper understanding of the partner business and thus had information and context for which new connections could be made. The importance of getting the chain together for the connection of diverse ideas for co-innovation is also consistent with the literature (Santos et al., 2004).

In addition to this structuring of chain members, I saw that when processes were jointly created to coordinate the chain, both partners were getting the information they needed in a streamlined, efficient and regular manner thus improving information exchange within the chain on which to base decisions.

#### *Improving the collaborative environment*

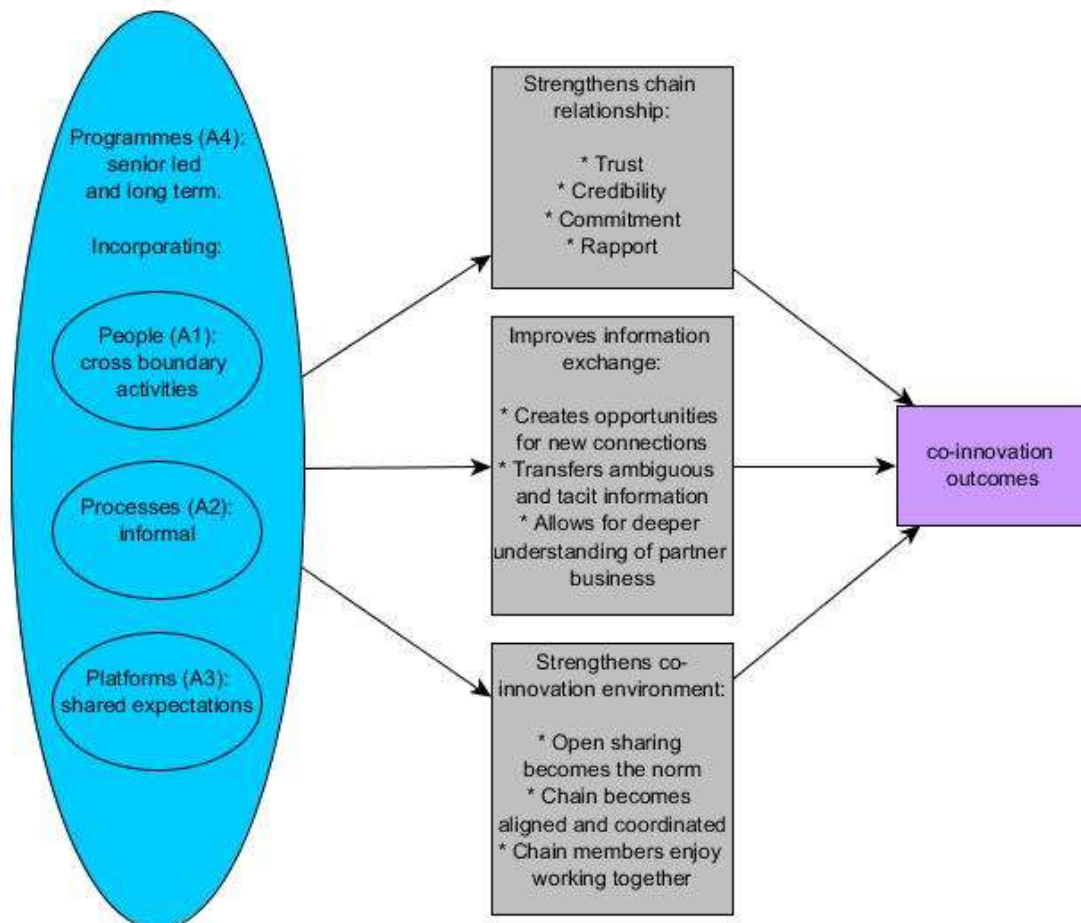
When sharing information became part of regular communication within collaborative chains, transparency became routine. The collaborative chain participants had become so familiar with transparent sharing that it became the norm. When open sharing is the norm (as opposed to being transparent solely about a particular area of the chain) collaboration also becomes a norm.

The co-innovation environment was further enhanced by the regular sharing through discussing strategies and goals. The collaborative chains developed joint future plans aligning the chains. This process is also consistent with extant literature (Alexander & Van Knippenberg, 2014).

#### *Improving the collaborative relationship*

The collaborative chains were governed by shared expectations of trust and commitment. Trust and commitment are widely acknowledged as important factors for strong relationships (Gulati & Nickerson, 2008; Kumar, 1996). Furthermore, chain members spending time together, built rapport amongst chain members. Strong chain relationships are a requirement for co-innovation (Fearne, 2009).

**Figure 3: Suggested model for how chain architecture influences co-innovation**



#### ***4.4.3 How my findings compare with the MacCormack et al (2007) framework***

In relation to the first three pillars of people, processes and platforms, the findings in the collaborative chains differed from that of MacCormack et al. (2007) in all but one element of each pillar. In 'people', the chains were found not to recruit, manage, lead, reward or have multi influential gatekeepers. In 'processes', the chains did not have joint formal innovation processes and only sometimes performed trials on new innovations. In 'platforms' the chains did not have joint knowledge management systems or significant joint technology. Furthermore, in these pillars, there was no discernible difference between the collaborative chains and the trading chain thus my findings cannot confirm the MacCormack et al. (2007) framework in this agri-chain context.

Where my findings are aligned with the MacCormack et al. (2007) framework is: 1) the collaborative chains were found to organise regular cross boundary activities; 2) the collaborative chains both demonstrated informal mechanisms to coordinate co-innovation; and 3) the collaborative chains both reported shared expectations of trust and goodwill. These elements are consistent with MacCormack et al. (2007) framework and also differentiated the collaborative chains from the trading one.

It was in the fourth pillar, taking a programmed approach to co-innovation, that the collaborative chains were most closely aligned to the MacCormack et al. (2007) framework with all three elements present in both the collaborative chains and none of the elements found in the trading chain. This finding not only provides support for using a programmed approach to co-innovation but suggests that in agri-chains it is the most important of the four pillars.

#### ***4.4.4 My extension of the MacCormack et al. (2007) framework and what that might mean for co-innovation in global agri-chains***

Not only has this study once again taken a framework from the high-tech world into that of the agricultural sector but it has also extended MacCormack et al. (2007) in terms of the unit of analysis. MacCormack et al. (2007) used semi-structured interviews to gather data from managers across projects at the firm level, however this thesis interviewed individuals to gain their collective attitudes to extend the lens across business boundaries.



Furthermore, to better relate the present findings to the existing literature I suggest that whereas (MacCormack et al., 2007) treated each of the pillars as stand-alone structures, I found that the apparent elements of the first three pillars (people, processes and platforms) were not structures of the individual businesses, but sub-structures of the chain's joint programme (figure 3).

A further extension of the MacCormack et al. (2007) framework is how the integrated elements achieve co-innovation. I suggest, the programmed approach (P4) with its substructures of people (P1); processes (P2), and platforms (P3) supported the collaborative chains co-innovation activities in three broad ways: 1) strengthening the chain relationship 2) by improving information exchange, and 3) by strengthening the co-innovation environment (figure 3). This will be discussed in more detail in section 6.2.

**Table 3: Summary of how the MacCormack et al. (2007) framework has been extended by this work**

<b><i>The MacCormack et al. (2007) framework</i></b>	<b><i>My extension of the work</i></b>
Developed from high-tech businesses	Applied to global agricultural chains
The unit of analysis is managers and collaborative projects at a single firm level	The unit of analysis is individuals to understand collective business attitudes to understand a cross business projects
The original framework treated each of the pillars as stand-alone structures	In this study the apparent elements of the first three pillars (people, processes and platforms) were not structures of the individual businesses, but sub-structures of the chain's joint programme
The original framework did not suggest how the pillars led to co-innovation outcomes	I suggest, the programmed approach supported the collaborative chains co-innovation activities in three broad ways: 1) strengthening the chain relationship 2) by improving information exchange, and 3) by strengthening the co-innovation environment.

#### ***4.5 Bringing the frameworks together***

The various constructs (barriers, facets and pillars) over these three frameworks appear to intersect in how they influence co-innovation outcomes, therefore, I suggest that there is a relationship between engagement, communication and architectural practices in these chains. In combination, the practices and structures investigated through the application of the three frameworks to the agri-chain area of interest were thought to be influencing co-innovation in three broad ways, or through three co-innovation facilitators:

- 1) By strengthening the chain relationships;
- 2) By Improving chain information exchange; and
- 3) By creating a co-innovative environment

In this section I bring the frameworks together as a single model (figure 4) with reference to both my own findings and that of the extant literature reviewed in section 1.10. The section is structured as follows:

4.5.1 Structuring the collaboration with a programmed approach

4.5.2 Suggests how engagement, communication and architectural practices might strengthen the chain relationship

4.5.3 Suggests how engagement, communication and architectural practices might improve information exchange

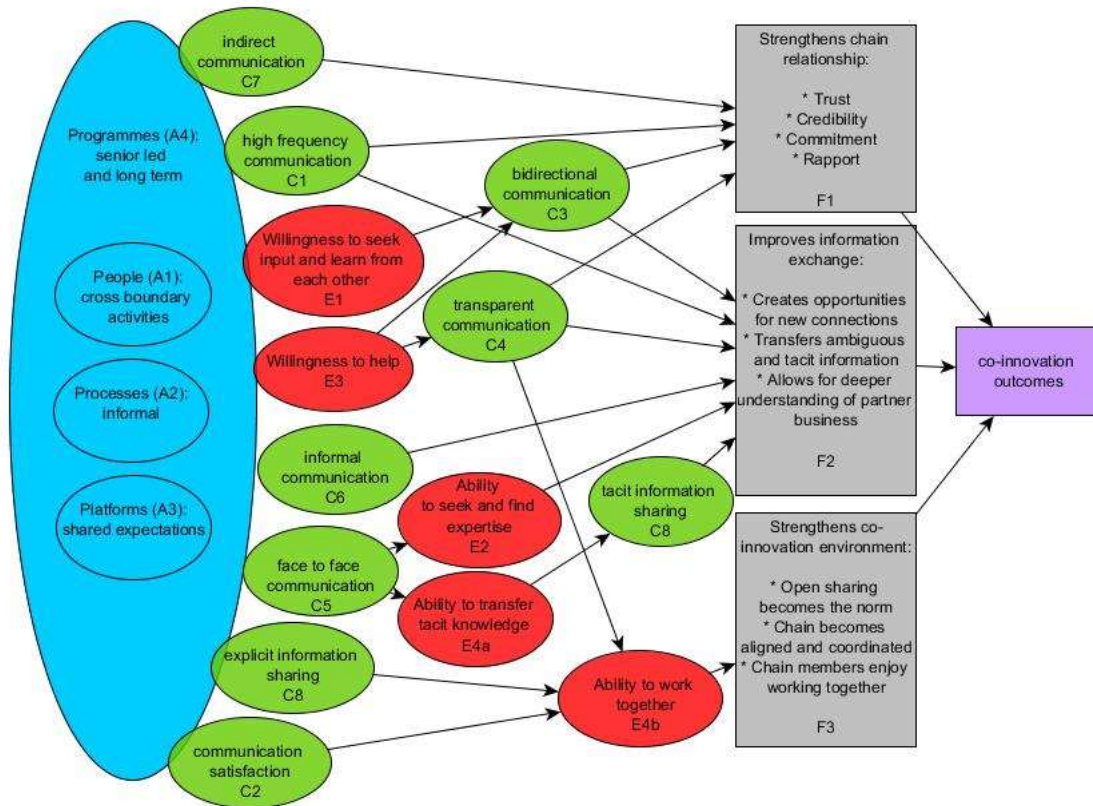
4.5.4 Suggests how engagement, communication and architectural practices might create an environment for co-innovation

4.5.5 Brings all of these practices together and maps an interpretation of how the frameworks might connect with each other and influence co-innovation

To make the origin of each construct clear, in the integrated model (figure 4) the business architecture pillars are blue and labelled A1 through to A4. The communication facets are green and labelled C1 through C8. The engagement barriers are red labelled E1 through E4. The proposed co-innovation facilitators are grey labelled F1 through F3.

**Figure 4: Suggested model for establishing co-innovation facilitators in agri-chains**

**A=architecture, C = communication, E = engagement, F= facilitator**



#### **4.5.1 Structuring the collaboration with a programmed approach**

This study's findings suggest that the initial element to the collaborative chains co-innovation success was the intentional decision of the two businesses to commit to strategically working together and organising this collaboration through a programmed approach (A1). This was found to be the initial element because in both of the collaborative chains the supplying partner, holding the PBR, actively sought a marketing partner who was willing to operate with an open and coordinated chain. This allowed the supplying PBR holder to maintain some control and connection to their branded variety in the market without having to be in the market themselves. Whilst a number of senior management members in chain one had a history of working together prior to the creation of the programme, the senior people involved in chain two had met through industry events but had not previously worked together at the time the initial agreement was negotiated.

Therefore, it is suggested here, that making this commitment to collaborate in this way is possible regardless of whether the chain has already worked together or not.

It was in the establishment of an inter-dependent joint programme that the collaborative chains were found to be most consistent with the literature on collaborative structures and most differentiated from the trading chain. The joint programmes in the collaborative chains were driven by senior management (MacCormack et al., 2007), with a long term commitment (Walters & Rainbird, 2007), a focus on information sharing (Simatupang & Sridharan, 2008), a desire for strategic chain alignment (Alexander & Van Knippenberg, 2014), and efficient chain coordination (Jassawalla & Sashittal, 1998), yet with enough flexibility and informality to allow for connections and decisions to be made (Kanter, 2011).

In terms of integration of the elements, Fjeldstad et al. (2012) claim that infrastructure allows employees to connect and share information. Whilst my findings support that claim I believe the building of chain infrastructure provides not only the physical platforms for communication but it involves a willingness and commitment by the chain to collaborate. Commitment and dependence are widely acknowledged as central to chain collaboration (Geyskens et al., 1998) and at some point a conscious decision to commit to the interdependence of a chain collaborative approach is required for chain co-innovation to occur. Whilst the establishment of the programme was found to be the initiation point of the chain co-innovation, it is speculated, from these case studies, that establishment of a programme is not sufficient in itself to influence co-innovation. The programme needs to be brought to life with chain member communication and engagement. There are similarities between my overarching structure of a programme, which encompasses people, platforms and processes being brought to life by engagement and communication practices, and that of Bonney et al. (2007). Bonney et al. (2007) assert that chain structures and processes are the enabling environment and with drivers of action (resources, ability and motivation) co-innovation may occur.

It was through chain communication and engagement practices that developed from the programmed approach that strong chain relationships (F1), improved information exchange (F2) and the creation of a co-innovative environment (F3) occurred. Since communication

and individual engagement require strong relationships, a high level of information exchange and a collaborative environment to exist, then the positive outcomes from the successive loops should lead to increased collaborative success. These three co-innovation facilitators and how they influenced co-innovation outcomes are discussed in the next three sections (4.2.2 – 4.2.4)

#### ***4.5.2 Practices that strengthen the chain relationship (F1)***

The findings suggest that indirect (C7), frequent (C1) and face to face communication (C5), as well as a willingness for information exchange (E1 & E3) leading to bidirectional communication (C3), are communication and engagement practices used in the collaborative chains which build trust, commitment, rapport and credibility thereby strengthening the chain relationship (F1). This thesis suggests that these communication and engagement practices build strong chain relationships and that a strong chain relationship is one of the three co-innovation facilitators influencing co-innovation outcomes in these chains (figure 4).

Chain communication in these case studies was highly non-coercive or indirect (C7) which is consistent with empirical research of influence strategies demonstrating that partnerships with high levels of cooperation and dependency are more likely to use indirect influence strategies (Frazier & Summers, 1984). Indirect communication consumes more time and requires more effort to be effective than direct orders, commands or threats (Frazier & Summers, 1984). This then suggests that only partnerships with the intention of long term commitment are likely to invest in being non-coercive with partners. Moreover, since non-coercive communication builds trust and is more likely to lead to agreement (Kumar, 1996), then indirect strategies make good business sense for collaborative partnerships.

Whilst communication frequency (C1) wasn't mentioned as a factor in any of the co-innovation projects, frequent communication was found to be common practice in all three chains. This was particularly prevalent in the collaborative chains which had slightly higher rates of communication than the trading chain. High communication frequency has been empirically linked with higher perceptions of communication quality (Mohr & Sohi, 1996), trust (Anderson & Weitz, 1989), cooperation (Anderson & Narus, 1990), and commitment (Hunt & Morgan, 1994). It is therefore speculated that in these chains the high frequency of

communication is contributing to relationship trust and commitment even though that wasn't an explicitly acknowledged element of the successful chain co-innovation projects.

What also appeared to occur in the successful chain projects, was when an individual was willing to ask for input or feedback (E1) the question opened up a bidirectional channel of communication (C3) which led to a deeper consideration of the issue from a range of perspectives. A willingness to give information (E3) is also required for bidirectional information flow. The need for both partners to participate in information flows in order for an effective relationship to exist, is both steeped in logic and supported by literature (Dwyer et al., 1987; Kumar, 1996; Mohr & Nevin, 1990). Furthermore, if a partner can't ask questions or get a full explanation then this may lower their trust in the information (Mohr & Sohi, 1995).

Participants also reported that face to face meetings (C5) with chain members increased rapport and strengthened the relationship. This finding is consistent with research that found that face to face groups report more cohesiveness and have a higher level of satisfaction of the group decisions and outcomes than groups of virtual teams (Warkentin et al., 1997). Thus regardless of whether face to face meetings are transferring explicit data any better than other methods used throughout the year, the face to face meetings appear to be particularly useful in building relationships. Strong chain member relationships are associated with higher performance (Warkentin et al., 1997) and are considered to be a key enabler for collaboration (Fearne, 2009).

#### ***4.5.3 Practices that improve information exchange (F2)***

The findings from this project suggest that frequent (C1), informal (C6) communication; a willingness for information exchange through seeking help and giving help (E1 & E3), leading to bi-directional (C3) and transparent (C4) communication; and face to face (C5) communication, resulting in chain members gaining the ability to find and share chain information (E2 and E4a) improves information exchange within the chain. Sridharan and Simatupang (2009) state that information sharing improves collaboration through better coordination. Whilst my findings would support that claim this thesis posits information exchange also leads to co-innovative outcomes by completing knowledge gaps, creating

opportunities for members to make new connections, enhancing the transference of tacit information and allowing for a deeper understanding of partner businesses (F2). Improving information exchange is the second co-innovation facilitator identified from this study (figure 4).

As mentioned in the above section, communication frequency (C1) wasn't mentioned as a factor in any of the co-innovation projects, however it was found to be a common practice in all three chains, particularly the collaborative ones. Prior research has found that communication frequency leads to greater opportunities for links to be made (Monge et al., 1992). It is therefore plausible that even though participants haven't acknowledged the role that frequent communication plays within their co-innovation projects, the high frequency gives chain members better odds for successful information exchange.

Also discussed in the above section, both a willingness to seek input (E1) and a willingness to give information (E3) resulted in and opening up of channel communication with both collaborative chains contributing and participating in discussions (C3). Bi-directional communication is not only beneficial to strengthening the relationship but when examining the successful co-innovation projects participants reported that bi-directional flow of information was beneficial for completing knowledge gaps of the partner company. Moreover, in the unsuccessful projects participants lamented that, in hindsight, they should have asked more questions about areas where they lacked knowledge. This finding is consistent with research that has found the connection of diverse ideas and perspectives is important for co-innovation (Santos et al., 2004; Zhang et al., 2010).

A willingness to give information (E3) also leads to transparency (C4). Transparency was found to be higher in the collaborative chains than in the trading chain and present in the successful co-innovation projects. Whilst the participant examples of transparency from this study were often for improved chain coordination as opposed to information shared specifically for a co-innovation project, it was found that transparency between chain members led to those chain members having a more complete view and deeper understanding of the chain which equipped them to leverage that information for co-innovation outcomes.



Informal communication (C6) was used almost twice as often as formal communication in the generation stage of the innovation projects according to the study participants. Furthermore, in examining the participant accounts of the projects that were said to have emerged out of the programme meetings, the ideas for those projects often came up in the informal moments of the meeting such as at drinks, dinners and on planes. This mix of formal structure with informal moments being a successful mix for idea generation is interesting as there can be some disagreement within the existing literature around how formality influences co-innovation (Mohr & Sohi, 1995). In terms of innovation, some research suggests there should be a mix of formal and informal connection points as we've found in these cases (Hunt & Morgan, 1994), however some research believes that high formality has a negative effect on innovation (Ebadi & Utterback, 1984) and informal, organic communication leads to better innovation (Olson et al., 1995). Whilst other researchers suggest that the absence of formal meetings may slow participant contributions to innovation processes (Monge et al., 1992). It is suggested here that a formal routine and agenda for meetings as part of the programmed approach (A4) works well as a base from which informal communication time should be encouraged in order to percolate the formal discussion and allow innovative ideas to emerge.

These three case study chains had a slight preference for email in day to day activities because of the ability of email to transmit information accurately and easily across time zones. However in terms of innovation, the findings suggest that chain members who met face to face more often (C5) demonstrated a deeper knowledge of the partner business operations and capabilities. These better connected chain members had a greater ability to access chain partner expertise and information (E2) and were thus in a better position to both transfer and receive tacit information from their chain partner (E4a). This ability to access partner expertise and information and transfer tacit information were greater in the senior executive groups than amongst members of the chain who weren't involved in the face to face meetings. This resulted in the senior chain members also being in a better position to leverage chain information and thus make connections by using their knowledge of the expertise, information and perspectives of other chain members. Not surprisingly the, senior executives generated more co-innovation ideas and were involved in more co-innovation projects than the non-executive participants in this study.

Whilst some research has found that face to face meetings did not exchange information significantly more effectively than in virtual teams (Warkentin et al., 1997), the same study found that face to face groups transferred more unique information in one meeting than the virtual teams did in three weeks of communicating online (Warkentin et al., 1997). Face to face communication is generally thought to be the richest form of communication exchange (Daft & Lengel, 1986). It is suggested here that chain coordination may be just as effectively achieved through email or other electronic means, as it is done so currently in these chains, however for innovation, which by its very nature is ambiguous and requires unique thinking, is likely to benefit from chain members having face to face meetings.

#### ***4.5.4 Practices that create a co-innovative environment (F3)***

The findings presented in the prior chapters of this thesis suggest that routine transparent (C4) and explicit (C8) chain communication leads to chain members being able to work together more effectively through alignment, coordination and open sharing becoming the norm. Communication satisfaction (C2) also led to supporting chain members to work together better as all of these elements strengthen the collaborative work environment (F3) (figure 4).

Transparency (C4) was found to be higher in the collaborative chains than in the trading chain and present in the successful co-innovation projects. Whilst in the above section the role of transparent communication in improving information exchange was discussed, the chain participant examples of transparency from this study didn't just show transparency contributing pieces of information to create a new idea but participants also talked about the importance of transparency for coordinating the chain and efficiently and effectively working together (E4b).

All participants reported extensive sharing of explicit knowledge (C8) for operational purposes. Explicit information sharing was also found to enable chain members to work together more efficiently and effectively (E4b). Cohesive teams have been found to be positively related to an organizational culture skilled at creating, acquiring and using new knowledge and developing insights (Joo et al., 2012). Furthermore, routine sharing of

information meant an open flow of information became the norm. When open sharing is the norm (as opposed to being transparent about a particular area of the chain that has been selected for innovation) collaboration in the chain also becomes a norm (Grams, 2012).

Similarly to communication frequency, communication satisfaction (C2) wasn't mentioned by the participants as a factor in the successful or unsuccessful outcomes of the chain co-innovation projects. However, communication satisfaction was a factor reported as present in all three chains and thus this finding suggests that communication satisfaction may still be an influencing factor, yet not a sufficient one, for co-innovation. Mohr and Sohi (1996) found a link between high communication satisfaction and communication quality, which the authors defined as completeness, credibility, accuracy, timeliness and adequacy of communication. It is plausible that the high levels of communication satisfaction may be an indication of better quality of communication which makes it easier for chain members to work together (E4b). Team cohesion has found to be positively correlated with a collaborative environment (Joo et al., 2012; Warkentin et al., 1997) and the team's ability to be creative (Barczak et al., 2010; Joo et al., 2012).

#### ***4.5.5 The virtuous cycle of these structures, practices and facilitators***

Whilst the model presented in figure 4 is an interpretation of findings from this study, it is acknowledged that other studies have found various associations between these structures, practices and facilitators. Other researchers are not always in agreement about how these constructs fit together. It has been found that there is a critical need for trust in relationships as a precursor to transparent information exchange (Fearne, 2009; Kumar, 1996). Other research has found that the relationship between these two elements can occur the other way around. That is, over time the occurrence of information exchange will strengthen relationships through building of credibility and interdependence (Frazier & Summers, 1984). In a similar fashion, collaborative culture has been found to facilitate communication and information sharing (Larson & LaFasto, 1989), concurrently, face to face and open and frequent communication have been found to build a collaborative culture (Gratton & Erickson, 2007). Information sharing improves collaboration through better coordination (Sridharan & Simatupang, 2009), concurrently better coordination improves information exchange (Fjeldstad et al., 2012). Structures and processes are an enabling

environment for which motivated employees can find opportunities to co-innovate (Bonney et al., 2007), concurrently motivated employees create protocols to co-innovate (Fjeldstad et al., 2012).

Whilst these converse findings may initially sound contradictory, on closer examination they make sense. From findings in these chains, I suggest that as communication and engagement practices get stronger between the partners then the chain relationship, information exchange and the collaborative environment is also likely to increase; and a stronger chain relationship, better information exchange and a collaborative chain environment is likely to have a positive influence on communication and engagement practices and thus, a virtuous cycle exists where successive loops of the cycle promote success. Collaborators engage in iterations of learning cycles and trust and commitment consequently build over time (Doz, 1996) and so the characteristics of the collaboration will also change over time (Nidumolu et al., 2014). For this reason, it is theorised, that in the suggested integrated framework (figure 4) the elements are positively looped together. The flow of this model can increase with collaborative structures, practices, and in the presence of trust, information exchange and a collaborative culture, or conversely, when trust is broken, the information exchange breaks down and the collaborative environment sours resulting in the co-innovation cycle slowing down.

#### ***4.6 Differences found between these agri-chain case studies and the extant literature in high-tech chains***

In chapter 1, the literature review, I talked about the nuances of the agricultural sector which make adopting co-innovation challenging. These include; the impact Mother Nature has on the sector making supply and demand unpredictable, volatile and complex (Stirling, 2013); the difficulties of collaborating in commodity markets (Fearne et al., 2001); the long product development times for new varieties (Kilgour et al., 2008); and the adversarial nature of the agricultural sector (O'Keeffe, 1998). In this section I discuss if these differences in the agricultural sector explain some of the differences in the findings of this study.

#### ***4.6.1 New proprietary varieties led to the adoption of a programmed approach***

New proprietary varieties which consumers can differentiate from existing varieties are seen as critical to innovation in fresh produce (Kilgour et al., 2008). One of the chain challenges of launching new genetics, however, is that these innovations can take a decade or longer to commercialise (Kilgour et al., 2008; Matopoulos et al., 2007) thus when co-innovating with new proprietary varieties, committing to a long term programmed approach to co-innovation makes sense.

The initiation of the collaborative programmes in this study came about because the PBR holders wanted a way of accessing the international market and maintaining some control and connection to that market without having to build the market competencies themselves. With the significant resources that had gone into the development of proprietary variety, protecting the integrity of both the product and brand presentation to the consumer was of utmost importance to the collaborative chains and thus a chain partner was required, not an arms-length in-market distributor. Value had been created over the years and thus there was a need for a mechanism for the creators of that value to capture it. This would not be possible if the product and its inherent value was surrendered to the next step in the chain.

A further reason why the collaborative chains in this case study took a committed programmed approach was that the development of their new varieties was a long term project. Not just in terms of the domestic genetic creation of the variety, but in both collaborative cases the new varieties were also grown in the international market to make the most of the geographically diverse growing seasons to lengthen the availability period of the product. Yet from plant material arriving in the country to getting a commercial crop can be almost 10 years. From first planting to getting a crop is several years. The first few years of crops are also often small and even more susceptible to weather than more mature crops. Furthermore, if the variety is completely new, there may be some issues with different climatic and soil conditions that also need to be overcome. Over these early years bud wood is multiplied so that the project can be expanded. Finally, eight to 10 years later there might be enough volume that is marketable to a specific customer.

Whilst (MacCormack et al., 2007) found the programmed approach to be one of four pillars to collaborative capability in high-tech industries, this study found the programmed approach to be one of the most critical elements used by the collaborative chains for their co-innovation success. I suggest that a key factor in this finding is due to the importance of new proprietary varieties to co-innovation in the collaborative cases of this study.

#### ***4.6.2 Technology important for chain co-ordination but may not always be necessary in chain co-innovation***

In the literature review I include Fearne and Hughes (1999) report on their findings from interviewing chief executives from some of the UKs most successful fresh produce suppliers. The authors identified several key elements that set the successful fresh produce suppliers apart from other suppliers. The critical factors included suppliers having a strategic vision, organisational structure, culture and knowledge for supplying the large and sophisticated UK retailers. The authors also found that the most successful suppliers had invested in technology to best serve the customer and measure and control costs.

Whilst collaborative chain one was the only chain to report using integrated technology, to manage inventory, other commonly used industry technologies such as EDI files to transmit data were used to make the transfer of data more effective and efficient, thus best serving the customer and controlling costs. Whilst technology was used for efficiency and coordination it was not found to be used in the co-innovation projects in this study. With only eight of the 26 successful co-innovation projects in the chain classified as 'technology' innovations (as defined by Caiazza et al. (2014)), all of those eight were developed in informal, low tech ways. For example, when there were technical growing difficulties in new growing regions, agronomists and farmers found meeting together on farm to discuss and collaboratively resolve the issues was the most effective way of transferring tacit technical information and working through any technical issues. Joint varietal evaluations were done in the same fashion: agronomists and marketers getting together on farm, face to face to discuss the possibilities of growing and marketing the new products. Another example was the implementation of modified atmosphere (MA) bags to improve freshness of fruit on arrival. The technology was developed by a third party, to implement the technology the chain conducted trials which involved trial shipments with hands-on outturn assessments,

again without the need for specialised joint platforms to share the methods, conduct the work or discuss results.

Compare this to the high-tech examples used by MacCormack et al. (2007) referenced in the literature review on the use of integrated technology in the high tech chains the authors studied. The authors gave examples of a company connecting over 50 global partners in an engineering project and requiring an integrated platform to do so. The same authors also showed what a disaster lack of technology integration can be in high-tech making an example of the Air Bus A380 project where German and French engineers used different design software and the lack of integration resulted in a 2 year delay costing \$6 billion (MacCormack et al., 2007).

Of course, technology is important for agri-chains: for efficiency, for coordination, for measurement of key factors, and integrated technology could also be used in agri-chains to coordinate their co-innovation as seen in high-tech examples. However, the successful collaborative chain projects in this study demonstrate that co-innovation projects may occur without the use of high-tech platforms and this appears to be something that differentiates co-innovation in these agri-chains from co-innovation in high-tech chains.

#### ***4.6.3 The volatility of supply and demand led to greater emphasis on coordination processes***

A challenge of the agricultural industry is the constant changing of information due to the volatility of supply and demand. As discussed in section 1.4.2, the agribusiness sector is heavily impacted by climatic and weather conditions (Cantelaube & Terres, 2005; MacDonald & Hall, 1980) which translates into volatility and unpredictability in the chain (Stirling, 2013). The volatility means supply and logistics plans require continual updating and because fresh food is perishable, changes in the plans need to happen quickly as miscommunication on supply and demand can be costly. For this reason, there is a critical need for supply and demand coordinating systems that are able to be frequently updated as changes become apparent. The collaborative chains emphasised a focus on collaboration for the sake of chain coordination as a priority over collaboration for innovation outcomes.

In the agricultural industry, this focus makes sense. Coordinating global agri-chains is complex. An uncoordinated chain, despite how innovative their products are, will not be able to survive if they are unable to create sufficient demand for their product before it perishes, or are unable to fill retail POs. Furthermore, because these chains produce food for human consumption, and there is increasing consumer scrutiny over food safety, it means agri-chains must have clear traceability systems which also require chain coordination.

#### ***4.6.4 The need to manage branded varieties led to the importance of intermediaries in these agri-chains***

As discussed in section 1.3.4, some researchers argue that wholesalers and agents, seen as costs to the chain, should be removed (Fearne, 2009) because intermediary businesses connecting the up and down stream ends are becoming irrelevant (Welch & Mitchell, 2000). It is true that supermarket buying teams are seeking to cut costs, which the wholesalers represent (Reardon et al., 2003), and world-wide retailers are strengthening relationships with key, often vertically integrated, grower / shipper suppliers who can provide year-round, safety assured supply (Calvin et al., 2001; Reardon et al., 2003). The trend for large suppliers to sell directly into large retailers makes sense in the case of high volume commodity products and home (store) brand products. From a retailers point of view, a shorter, cheaper supply chain may help them to achieve their objectives of attracting consumers into their stores with an 'everyday low price' (EDLP) on these commonly purchased items. From a supplier's point of view, going direct to a retailer, and / or packaging in a home brand may secure large volume supply contracts which may provide some level of stability to their business model.

The collaborative case chains of this study, however, were not representative of this trend towards a shorter, direct to retail supply chain. On the contrary, the intermediaries in the collaborative cases of this study were critical chain members and the locus of chain co-innovation. An explanation of this is that in both the collaborative case chains, the supplying business owned a suite of PBRs and actively sought partners who would work collaboratively with them to build and represent the brand in the export market. Retailers are increasingly concerned with their own store brands. Retailers want consumers to



connect with the store and have little interest in building brands for suppliers particularly if that brand is available in their competitor's stores. If a chain has a branded product then the onus is on the chain to establish and promote the brand. This can be difficult for global suppliers with no in market connections and is why having a trusted in market partner who can collaborate in this function makes sense.

Furthermore, whilst retailers want differentiated products in their stores, the locus of innovation is rarely at the retail level. Retailers are looking at their suppliers to do the innovating for them and are unlikely to invest in an unproven variety that will be 10 years or more until commercial volumes are available. This leaves suppliers, or the rest of the chain having to resource innovation themselves and thus wanting to maximise return on that investment when new products are commercialised. This makes offering the product solely to one retailer unappealing. Exclusive offers to retailers in agri-food tend to be a variation on a pack, or variation on an ingredient but these slight variations are not meaningful differentiations (Leijnse et al., 2008).

Imported, seasonal agri-products also require specialised skills and management. Whilst increasingly large retailers have their own import divisions with skilled staff who can navigate import registrations and protocols the added complexity, particularly with seasonal or specialty products, is often something retailers are not interested in handling. Retailers want larger, easy-to-handle suppliers to reduce buyer complexity. Having specialised buyers managing a portfolio with a large number of specialised products from a large number of foreign suppliers is not a typical position a retailer wants to take. Moreover, importation of perishable agri-products has added costs and time constraints when things go wrong. A typical retailer would simply reject a load that doesn't meet retail specifications with few other options for handling the situation. An in market partner is likely to have more options on re-conditioning or diverting the load to at least get some compensation for the problem.

The direct to retailer model suits large suppliers of commodity domestic products more so than it does innovative, branded, seasonally imported agri-products. I speculate that in market partners who have expertise in collaborating with specialised branded product partners will have a place in co-innovative agri-chains in the future.

#### **4.7 Discussion chapter summary**

In sections 4.2 to 4.4, I discussed my use of three frameworks from non-agricultural sector studies and used them as a lens for the context of co-innovation in global agri-chains. Whilst some differences were found between my findings and the original findings of the framework, all of the guiding models applied well to this context. All three models were extended by this work in several ways. They were all applied to different contexts in terms of unit of analysis and industry and a suggested model of how they might influence co-innovation was suggested. Each were also extended in these additional ways: the Hansen and Nohria (2004) framework was extended in terms of adding hierarchy as a moderator to collaborative ability (table 1). The Mohr and Nevin (1990) model was extended with additional communication elements which were found to be apparent in the co-innovation projects of this chain (table 2); and the MacCormack et al. (2007) framework was extended in that the authors treated each of the pillars as stand-alone structures, whereas I found that the apparent elements of the first three pillars (people, processes and platforms) were not structures of the individual businesses, but sub-structures of the chain's joint programme (table 3). These extensions are important contributions of this thesis.

In section 4.5 I suggested a model (figure 4) for how these frameworks might integrate in their influence on co-innovation outcomes in global agri-chains. This is another key contribution of this work. The various constructs (barriers, facets and pillars) over these three frameworks appear to intersect in how they influence co-innovation outcomes. Therefore, I suggest that there is a relationship between engagement, communication and architectural practices in these chains. In combination, the practices and structures investigated through the application of the three frameworks to the agri-chain context were thought to be influencing co-innovation in three broad ways, or through three co-innovation facilitators: by strengthening the chain relationships; improving chain information exchange; and by creating a co-innovative environment

In 4.6 I discussed the findings in light of the nuances of the agricultural sector which make adopting co-innovation challenging for the industry. These include; the impact Mother Nature has on the sector making supply and demand unpredictable, volatile and complex (Stirling, 2013) by which I suggest leads to greater emphasis on co-ordination processes; the

difficulties of collaborating in commodity markets (Fearne et al., 2001) by which I suggest leads to the need to manage branded varieties; the long product development times for new varieties (Kilgour et al., 2008) by which I suggest leads to the adoption of a programmed approach; and the adversarial nature of the agricultural sector (O'Keeffe, 1998) by which I suggest leads to less use of technology to connect the chain, and a greater focus being on building strong relationships.

In the following chapter I will conclude this thesis by presenting implications for both practice and research; address the research parameters including both interviewer and researcher bias; and make suggestions for future research.

## **Chapter 5: Conclusion**

The purpose of the chapter is to conclude this project with a summary of the thesis; identify the practical and research implications which have emerged from the study; and address the research parameters and the originality of the study.

### ***5.1 Thesis summary***

This thesis comprises five chapters. The structure was as follows:

Chapter 1: literature review where co-innovation and value chain literature was reviewed in the context of global agri-chains. From this review three key themes of engagement, communication and architecture emerged. The guiding frameworks were chosen for both their relevance and fit.

Chapter 2: presents the basis for using an interpretative qualitative multi-case study approach in the research design and methods chapter.

Chapter 3: reports on the findings from interviewing chain participants about their collaborative practices and co-innovation projects.

Chapter 4: discusses the findings and what they might mean for co-innovation practices in agri-chains. The findings are compared and contrasted with the original frameworks and supporting literature.

The thesis is concluded in this chapter, chapter 5.

### ***Chapter 1: Literature Review Summary***

The review of the extant chain collaboration literature led this study to focus more closely on three themes; 1, how individuals in the chain engage with each other; 2, how they communicate with each other and 3, the structures and processes (architecture) that integrate the chain. In order to examine these three themes, three existing frameworks which were developed in non-agricultural contexts were selected, as their emerging relevance became clear, reviewed and propositions were developed. The three frameworks were: Hansen and Nohria's (2004) framework on how to build collaborative advantage by eliminating barriers of individual's unwillingness and inability to collaborate, which was used as a framework to examine engagement. Mohr and Nevin's (1990) theoretical model on

communication strategies in marketing channels, which was used as a framework to study communication practices; and MacCormack et al's (2007) proposed four pillars of collaborative capabilities, which was used as a lens for chain architecture. These frameworks were selected not just for their relevance in terms of guiding the investigation of a specific theme, but for their ability to fit together in order to answer the main research question of how collaborative practices influence a global agri-chains' capability to co-innovate.

### *Chapter 2: Research design and methods summary*

This study was based on an interpretative qualitative multi-case study approach with a research design based on Rosenberg and Yates' (2007) schematic for case study research. The underpinning theoretical framework of the three existing models emerged from a review of the literature and their emerging relevance as the data were collected and analysed. Participants were purposively sampled from three global agri-chain case chains. Chain one was a collaborative chain and was used as a theory building case, which was compared to a similar case (chain two) and contrasted with a differing arms-length trading chain (chain three). Data were collected by interviewing 29 employees of chain organisations about the three themes and their co-innovation projects using the convergent interviewing technique. Audio recordings were uploaded and transcribed into N-Vivo where categorisation, coding and unitisation were performed. Excel matrices and tables were also used to draw conclusions and theory development.

### *Chapter 3: Results*

The findings from the participants' interviews are structured by reporting on each of the frameworks in turn. The key findings are as follows:

Engagement findings: The collaborative chain participants showed greater willingness to collaborate and were better able to transfer tacit and complex knowledge than in the trading chain. However, the collaborative and trading chain participants were equally able to seek and find expertise within their partner organisation.

Communication findings: The collaborative chains used highly frequent, bi-directional, (mostly) informal and indirect communication practices. The communication styles reported

to be utilised in successful co-innovation projects were bi-directional, informal, indirect, transparent and face to face communication.

Architectural findings: None of the chains significantly organised their people, processes or platforms for collaboration and in these elements there were no discernible differences between the collaborative chains and the trading chain. However, the collaborative chains did take a programmed approach to co-innovation which was aligned with both the MacCormack et al. (2007) framework and where the collaborative chains differed from the trading one.

#### *Chapter 5: Discussion summary*

In the discussion chapter I discussed what might findings might mean for co-innovation in global agri-chains, comparing and contrasting my findings with the chosen constructs and supporting literature. Whilst some differences were found between my findings and the original findings of the framework, all of the guiding models applied well to this context. The existing frameworks were extended by this work in several ways. They were applied to a different unit of analysis and different industry. From the new context, speculative models of how each of the constructs might influence co-innovation were suggested. The models were also extended in these additional ways: the Hansen and Nohria (2004) framework was extended in terms hierarchy as a moderator to collaborative ability. The Mohr and Nevin (1990) model was extended with additional communication elements which were found to be apparent in the co-innovation projects of this chain; and the MacCormack et al (2007) framework was extended in that the authors treated each of the pillars as stand-alone structures, I found that the apparent elements of the first three pillars (people, processes and platforms) were not structures of the individual businesses, but sub-structures of the chain's joint programme. These extensions are important contributions of this thesis.

The most significant contribution of this thesis, however, is in the integration of the models in order to address the problem of how collaborative practices in global agri-chains influence the chain's co-innovation capabilities. The integrated model presented in chapter 4, figure 4, suggests the constructs together intersect and influence co-innovation through three broad co-innovation facilitators: 1) strengthening the chain relationships; 2) improving

chain information exchange; and 3) creating a co-innovative environment. Furthermore, it is theorised, that in the suggested integrated framework (chapter 4, figure 4) the elements are positively looped together. The flow of this model can increase with collaborative structures, practices, and in the presence of trust, information exchange and a collaborative culture, or conversely, when trust is broken, the information exchange breaks down and the collaborative environment sours resulting in the co-innovation cycle slowing down.

Since all three constructs selected as the guiding frameworks for this agribusiness study, were from non-agricultural industries, I also discuss my findings in light of the challenges and nuances of the agricultural sector which include; the impact Mother Nature has on the sector making supply and demand unpredictable, volatile and complex (Stirling, 2013) by which I suggest leads to greater emphasis on the coordination process; the difficulties of collaborating in commodity markets (Fearne et al., 2001) by which I suggest leads to the need to manage branded varieties; the long product development times for new varieties (Kilgour et al., 2008) by which I suggest leads to the adoption of a programmed approach; and the adversarial nature of the agricultural sector (O'Keeffe, 1998) by which I suggest leads to less use of technology to connect the chain, and a greater focus being on building strong relationships.

## ***5.2 Implications***

### ***5.2.1 Practical Implications***

The key practical implications of establishing a model of co-innovation with a global agri-chain partner include:

1. A programmed approach which is senior led, set up for the long term and with chain members who are aligned with the programmes purpose and goals and can thus work well as a foundation for co-innovation in agri-chains.
2. Chain co-innovation is unlikely to be able to occur with every partner as it is an energy and resource intensive endeavour, therefore if the partner isn't right then the risks and resources may outweigh the collaboration benefits.

3. Arranging chain members to regularly meet face to face appears to be a structure which supports cross boundary learning, information sharing, chain coordination, strategic planning, brainstorming and decision making and improved the chain's co-innovation outcomes.

4. Processes and platforms to coordinate the chain are beneficial to chain co-innovation however, chain co-innovation can occur without high-tech processes and platforms.

6. Chain member involvement decreased knowledge barriers and thus improved chain co-innovation capabilities. This implication is particularly important for mid-level chain members who will have greater opportunity for increased co-innovation outcomes if they have greater involvement with chain partners.

7. Intermediaries in the chain will continue to be relevant to global agri-chains if they have developed specialised skills such as strong relationships, importation expertise, brand development and management, and collaboration and co-innovation capabilities.

### ***5.2.2 Research implications***

All three existing frameworks selected from the review of the literature to be applied to the agricultural value chain context worked well as a guide for this study. My findings from the co-innovation in global agri-chains context can provide some support for the first two frameworks, but limited support for the third model.

My findings of individual engagement from the agri value chain context provide strength to the Hansen and Nohria (2004) framework for the relational barriers of willingness and individual's ability to transfer tacit knowledge, however there was no discernible difference between the collaborative and trading chains in their ability to seek and find expertise indicating that an individual's ability to seek and find partner expertise may be necessary to collaboration, but not sufficient for collaboration by itself.

My findings of communication practices from the agri value chain context that these collaborative chains have highly frequent, bi-directional, (mostly) informal and indirect



communication supports the Mohr and Nevin (1990) model which posits that those same facets suit relational, supportive and symmetrical relationships. Further support came from looking at the case chain outcomes, which in my research were measured by successful co-innovation projects. The communication styles reported to be utilised in successful co-innovation projects were bi-directional, informal, indirect, transparent and face to face communication. Despite frequency not being specifically mentioned as a communication practice of co-innovation projects it was mentioned as a routine practice of the chain, and therefore the communication practices used for collaborative outcomes was were as expected from the model.

My findings of chain architecture from the agri value chain context cannot confirm the MacCormack et al. (2007) framework in the first three pillars of people, processes and platforms. In all but one element of each pillar the proposed collaborative factors were not found to be present and the collaborative chains were no different from the trading chain in this regard. My findings did provide strength for the final pillar, however, where the collaborative chains made extensive use of the programmed approach to their co-innovation and this is what set their co-innovation chain structures apart from the trading chain.

The unique extensions of each of the frameworks which emerged from this study also provide research implications for researchers who might want to use the frameworks in the future. The Hansen and Nohria (2004) framework can be extended in terms hierarchy as a moderator to individual collaborative ability. The Mohr and Nevin (1990) model can be extended with the additional communication elements of satisfaction of communication frequency; transparency of information exchanged, mode of communication and tacit versus explicit content of the communication. The MacCormack et al. (2007) framework can be tested to investigate if the first three pillars are sub-structures of a programmed approach in co-innovating chains.

### ***5.3 Research parameters***

Interviewer bias, sampling bias, researcher bias and researcher error are parameters of this study which are addressed in this section.

Researcher bias is a concern of interpretive work (Merriam, 1995), in that researchers, can inadvertently ask leading questions or put their own slant on analysis (Onwuegbuzie & Leech, 2007). This concern was combated by gaining knowledge of the relevant theories prior to commencing the investigation (Riege & Nair, 2004) and ensuring my philosophical position and background in the agricultural industry were clear to the reader (Merriam, 2014).

Sampling bias is another concern of case studies where non-random, small samples are criticised as an external validity issue due to the questionable ability for findings to be transferred to a general population (Merriam, 1995; Rao & Perry, 2003; Riege & Nair, 2004). The unique environment and nuances of the individuals, businesses and chains will have some bearing on the outcomes. This was addressed by choosing cases from differing agribusiness sectors and within those case studies varying roles were investigated which allows for a greater cross section of views (Yin, 2009). Furthermore, I acknowledge that whilst findings from small, non-random samples can't be generalised to a universal truth, with rich descriptions of the findings readers can decide for themselves if they wish to apply the findings to their situation (Merriam, 2014).

The data for this research were collected through interviewing individuals on co-innovation projects with their chain partner and on the elements of the three previously proposed frameworks in order to understand the influence of those themes on co-innovation. A stricture on the data quality achieved from interviewing people is that an individual's memory of an event may have changed over time, or individuals may prefer to report an altered version of their experience. Whilst this stricture was addressed by collecting a number of views within the individual businesses and cross referencing those accounts with those of other interview participants (Yin, 2009), and where possible, corroborating stories with documentation, it still must be acknowledged that the accounts given in the interviews are just one version of events.

The possibility of researcher error in categorisation, coding and interpretation is a hard parameter to admit but one that must be acknowledged (Dey, 2003). This is where the

importance of good research design, following process, cross checking work and peer review all become important in reducing errors (Dey, 2003). Using CAQDAS also played an important part in this aspect assisting in accurately capturing data and keeping it in order, not losing data when splitting and splicing and making it easier to check that data had been consistently handled and allowing the ability to search for inconsistencies (Dey, 2003).

#### ***5.4 Suggestions for further research***

Suggested ideas for future projects are discussed in two sections. In the first section I present ideas which have come from questioning whether the differences in my findings from these agricultural chains and that of the existing literature can be explained through agricultural industry differences or if these divergences are uncovering possible opportunities for the agricultural sector. In the second section I present ideas for future research which might address some of the research limitations discussed in the above section (5.3).

##### ***5.4.1 Suggestions for future research projects that have come from the differences between these findings in agri-chains and the high-tech frameworks used in this work***

Several divergences between the frameworks used to guide this study and the findings in the case chains have been identified. The differences were most evident when using MacCormack et al's (2007) framework to examine chain architecture where these chains were found not to employ the majority of people, processes and platforms elements which were proposed to be necessary. The agri-chains in this study were found not to employ the majority of the people, processes and platform elements as described in the architectural framework. There are a number of possibilities of why this may be the case. If I had interviewed different chains or even different people in the same chain or even the same people at a different time I may have had modified outcomes, though there is no evidence to suggest (other than reversion to the mean) that the outcomes would have been better aligned with MacCormack et al's (2007) framework. Thus extension and /or repetition of the study would improve the generalizability of the research. Alternatively, the differences in findings between the high-tech literature and my findings in the agricultural context may be due to the unique attributes of the agricultural industry and the missing elements may have less relevance to an agri-chain context. Another possibility is that the chains would increase

their co-innovation outcomes by adopting these suggested practices. Wilson and Doz (2012) from a decade of conducting field research of global innovation teams found that many of the companies in their study succeeded in co-innovating while implementing only one or two their guidelines. However, they found long term, continued success required best practice to be developed and honed over time. Are these elements missing because these chains have not yet reached their full collaboration potential? One way to test if the divergences found between this study's cases and the MacCormack et al. (2007) framework would be to conduct action research within co-innovating agro-food chains and measure the success of the initiative.

Another interesting project would be looking more closely at the role of intermediaries in co-innovation. Currently retailers are increasingly cutting out intermediaries and entering into direct to retail negotiations with large suppliers and supply conglomerates. Whilst the motivation towards cutting out complexity and cost and moving towards shorter supply chains is obvious, the collaborative chains in this study were not representative of this trend. I suggest that the in-market intermediary businesses in these chains play a critical role in the chain co-innovation. It would be interesting to study cases of chains where there was an intermediary who once worked connecting a grower group and retailer but have now lost that position. Not only could the researcher look at the changes in metrics for the initiative such as grower return, market growth and DIFOTQ (delivery in full, on time and in quality), but also co-innovation measures. Is the chain producing co-innovative outcomes? Who is leading chain co-innovation? And how is it being managed?

Lastly, another area of further research would be to investigate seniority as a moderator on an individual chain member's ability to establish co-innovation outcomes in the chain. Whilst this was not an original focus of the study, in all three frameworks hierarchy appeared to have a moderating effect on individual involvement on co-innovation outcomes. The senior chain members were more frequently involved in programmed collaborative activities, therefore had more communication and interaction with external chain members, and as a consequence had a deeper understanding of the people and capabilities of the external chain partner which led to a greater ability to access appropriate partner information and expertise to assist in co-innovation projects. The implication of this is the

more involved a chain member is in these activities, the greater their co-innovation capability will be. From a practical point of view, involving a wider group of chain members not only means additional chain costs but also the business risk of inexperienced members not being appropriate representatives when participating in cross chain activities. More investigation into the effect of hierarchy and how the structures and practices that occur in senior level can be exploited more widely through the chain would be an interesting and useful topic of research.

#### ***5.4.2 Further research to strengthen the research parameters***

As discussed in 5.2.2 each of the frameworks used as a lens transferred well in the context of global agri-chains and provided insight into both co-innovation in the agri-chain context as well as extensions of the research frameworks themselves.

Whilst qualitative work is not about ‘replicating’ the results, more individual experiences from more chains and in more contexts would strengthen this work, both in terms of using the individual frameworks applied in this study and empirical testing of the integrated model presented in chapter 4, figure 4. The research design for this study meant relationships between the frameworks and co-innovation could be drawn but future work would be required to show causality.

#### ***5.5 Originality of the study***

In order to be awarded a PhD, this research needs to make an original contribution to the field (Phillips & Pugh, 2010). Collaborative innovation in agricultural global value chains is still a relatively new area of interest which has gained momentum over the past few years, with much of the research work in co-innovating chains focussing on high tech players. Using Phillips and Pugh’s (2010) 15 definitions of originality, five major areas in which this project is unique are:

- 1) Applying existing research to a new area: the frameworks for analysis have been developed in mostly high-tech fields, I’m looking at them in global agricultural chains

- 2) Trying out something in a new location: little co-innovation in agri-chain research has been conducted in chains doing businesses between the four countries in this study
- 3) Looking at areas that people in agricultural research haven't looked before: this combination of individual engagement, communication and business architecture has not been studied in co-innovating chains
- 4) Making a new connection: whilst the elements in this study have been looked at in isolation and in some combinations, this is the first framework to combine these particular concepts and examine how, in combination, they are influencing co-innovation outcomes
- 5) Adding to knowledge in a way that hasn't been done before: I extended each existing framework in a way that hadn't been done before

### ***5.6 Conclusion chapter summary***

This chapter concludes this thesis submission in fulfilment of the requirements for the degree of Doctor of Philosophy. This chapter provided a summary of the thesis, identified practical and research implications of this work; addressed the research parameters of this study and stated the originality of the study.

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